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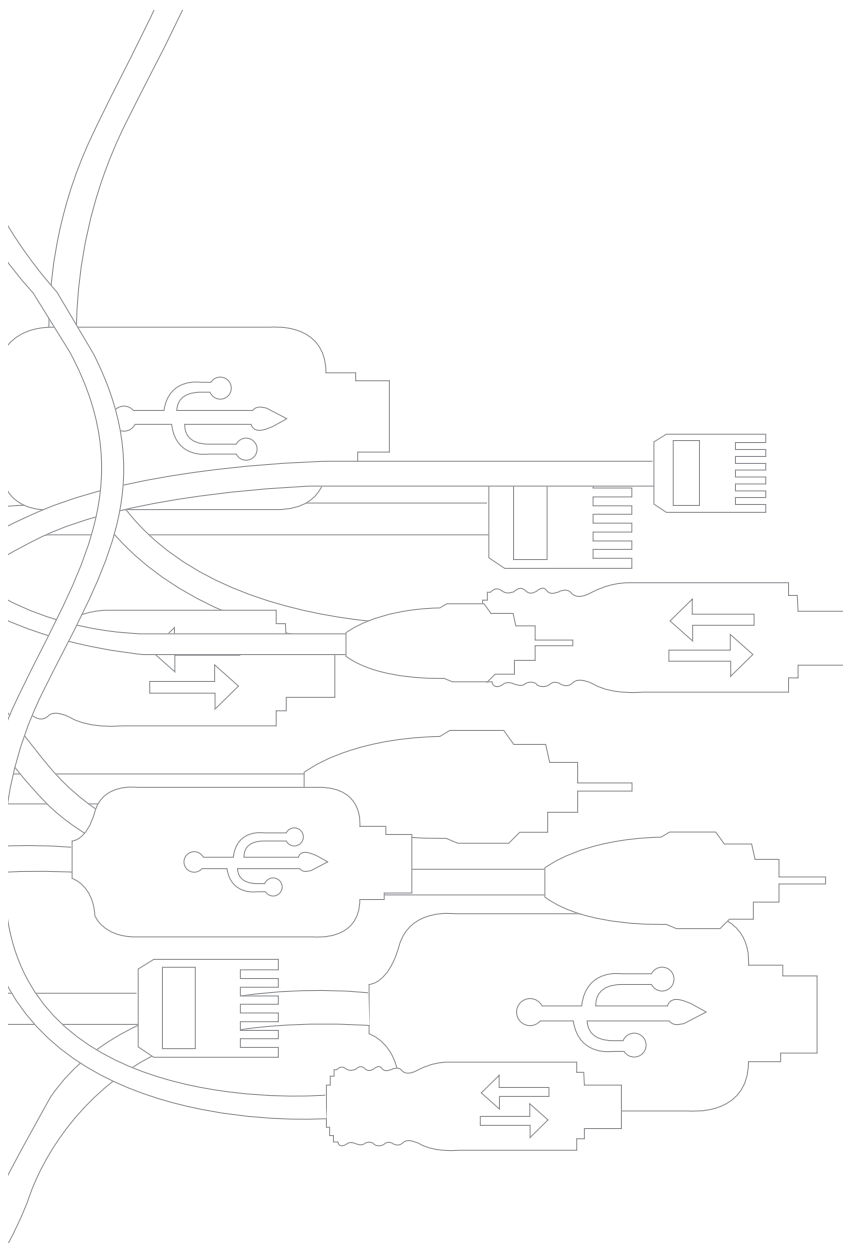
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TELEMANN USERS MANUAL DIGITAL TV SIGNAL ANALYZER

Chapter 1. Getting Started

- 1-1. Features
- 1-2. Safety instructions
- 1-3. Unit overview
- 1-4. Installation
- 1-5. Charging battery
- 1-6. Cable specifications



1-1. Features

Telemann Digital TV Signal Analyzers are the full-featured signal analyzers with complete spectrum analyzers(channel/frequency/tilt spectrum analyzers), which perform the level measurement, C/N measurement, CTB/CSO measurement for analog channels and power measurement as well as C/N measurement for digital channels. Scan, measurement files(saving/reviewing/deleting/printing) and connecting to a computer or printer and etc. are also performed with accuracy and easiness.

Accordingly, these models are the optimal units for the installation and maintenance of analog/digital television signal reception and distribution systems, which include any optional frequency, MATV (Master Antenna Television), CATV (Cable Television) and MMDS (Multi-channel Multi-point Distribution Systems), working a frequency range of 5MHz to 870MHz(or 1GHz→1730 VSB/QAM, 1730 QAM, 1730 OFDM)

○ **1720/1730 VSB/QAM** are the optimal signal analyzers to test and measure both digital TV signals(8/16VSB) and digital CATV signals(16/32/64/128/256QAM). Especially, these models give users the capacity to measure SNR(MER), EVM, Pre-BER, Post-BER, Constellation Diagram very easily and correctly, which are very important measurement factors for the digital signal quality.

○ **1720/1730 QAM & 1720/1730 QAM(A)** are the very excellent signal analyzers of choice for field testing of QAM digital signals on your cable TV system. They demodulate and accurately measure the QAM signals carried through the cable system. They provide the measurement power the field technicians need for the latest 16/32/64/128/256QAM digital technologies and are very simple to use, measuring SNR(MER), EVM, Pre-BER, Post-BER, Constellation Diagram. However, 1720/1730 QAM(A) measure digital level, Pre-BER, SNR (MER) only for digital signal.

○ **1720 /1730 OFDM** are the best choice for the field technicians to measure digital terrestrial TV(DVB-T standard). They demodulate and accurately measure the COFDM signals carried through the terrestrial TV system. They are very simple and convenient to use and measure SNR(MER), EVM, Pre-BER, Post-BER, Constellation Diagram for the digital TV channels.

Telemann Digital TV Signal Analyzers enable users to measure the followings. :

1) Analog channels :

- Video/Audio carrier levels measurement
- Carrier to Noise(C/N) ratio measurement
- CTB/CSO measurement

2) Digital channels :

- Power measurement(QAM, VSB, COFDM, QPSK signals)
- Carrier to Noise(C/N) ratio measurement

[1720/1730 VSB/QAM, 1720/1730 QAM, 1720/1730 OFDM]

- SNR/MER(Modulation Error Rate)
- EVM(Error Vector Magnitude)
- Constellation Diagram

All models are very comfortable and safe as they can be carried in a bag with a shoulder strap and can be used only opening the bag.

The weight is less than 1kg including two rechargeable battery packs. 128 X 64 dot matrix LCD screen shows measurement data clearly through both graphical and numerical form.

The contents of this manual will describe the care and operation of Telemann digital TV signal analyzers.

1-2. Safety Instructions

The following contents are for the prevention of user's damage and property loss. Read them thoroughly and use the unit rightly.



This symbol is intended to alert users of possible dangers in operating this unit.



General

- Don't disassemble, repair and remodel the unit as you please.
 - ⇒ When repair is needed, make contact with a service center.
- After being fully aware of users manual, operate and install the unit.
- Observe the ranges of power supply and measurements specified in the users manual.
- The unit and accessories should be installed, operated and maintained only authorized personnel. Faulty installation or service may result in an accident and make invalid warranty.



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Circumstances

- Use the unit in the temperature range from 0 to 60°C
- Keep the maximum humidity of unit under 80%.



Installation

- Don't connect any cables which are not offered by manufacturer.
⇒ It may cause fatal damage to the unit.
- Only use the chargeable batteries, adapter, RS232C cable, and cloning cable provided by Telemann. Using unauthorized accessories could avoid warranty.
- Keep in mind that the input level of F-JJ connector is 100 VAC rms/50-60MHz.



Battery Charge

- Don't supply the power to the unit without setting two packs of rechargeable batteries. It may give a serious damage to inner circuit.
- Recharge the batteries after being discharged completely, not to shorten their life span.
- Before using adapter, check whether its power is united to the main power. Or the inner circuit may be damaged.
- Use a car cigarette adapter with 13.8V. In case of a large sized car or freight car, however, use the adapter with 24V. Or the inner circuit may be damaged.
- Use a car cigarette adapter with 0.75A fuse. The inner circuit may be damaged.
- When you use a car cigarette adapter, get the car started before charging the batteries. Otherwise, the batteries may not be fully recharged or the car may be discharged.

Digital TV Signal Analyzer USERS MANUAL



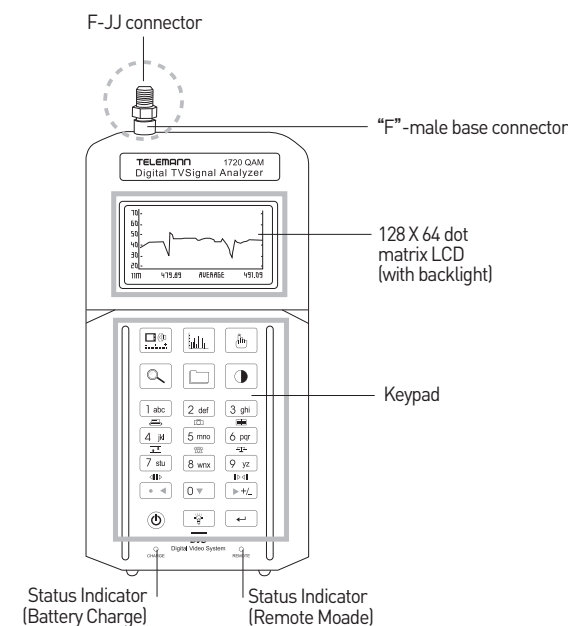
Maintenance

- Unplug the unit from the wall outlet before cleaning. Don't use liquid, wax and aerosol cleaner. Use a dry cloth.
- Use a dry cloth in cleaning contacting parts. Don't use a wet cloth.

1-3. Unit Overviews

The descriptions for each part and its function of Digital TV Signal Analyzer enable users to understand and operate the unit well.

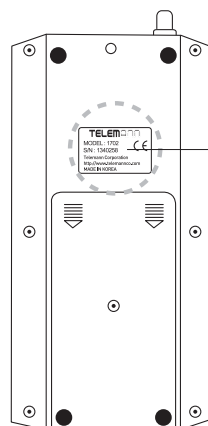
■ Front View





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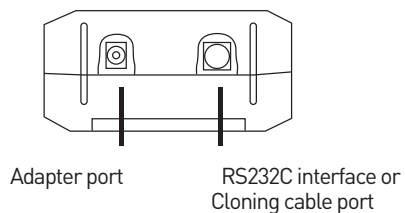
Back View



TELEMANN
MODEL : 1702
S/N : 1340258
Telemann Corporation
<http://www.telemannco.com>
MADE IN KOREA

Logo : TELEMANN
Model Number(MODEL) :
Serial Number(S/N) :
Manufacturer : Telemann Corporation
Website : <http://www.telemannco.com>
Origin : MADE IN KOREA

Bottom View



Adapter port

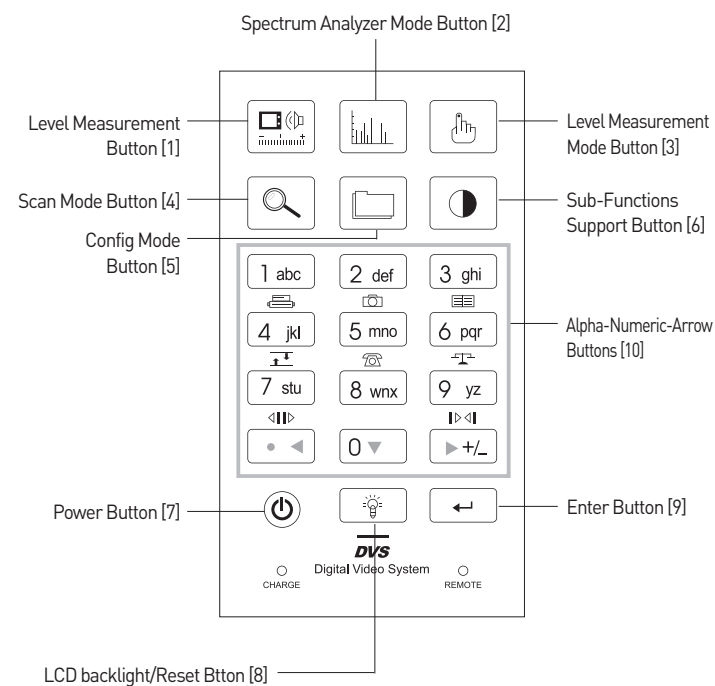
RS232C interface or
Cloning cable port

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Keypad - Each button's name and function

The unit has a 21-button keypad. By pressing designated button combinations, you can access to all the button functions of a keypad.

- 1) Six measurement buttons
- 2) Twelve Alpha-Numeric-Arrow buttons
- 3) One power button
- 4) One enter button
- 5) One LCD backlight/Reset button



**1] LEVEL MEASUREMENT BUTTON**

- (1) When you want to measure video/audio carrier levels for each channel or frequency,
- (2) When you want to select the measurement band among MATV, CATV, FREQ and MEMORY

**2] SPECTRUM ANALYZER MODE BUTTON**

When you want to select channel spectrum analyzer, frequency spectrum analyzer or tilt spectrum analyzer,

**3] LEVEL MEASUREMENT MODE BUTTON**

- (1) When you want to select the level measurement modes such as C/N, CTB/CSO, SNR/MER, BER, Constellation Diagram and etc. for the purpose of measuring signal levels,
- (2) In the spectrum analyzer modes, when you want to display “┐” cursor on the LCD screen,
- (3) In the TILT CHANNEL LIST and MEMORY CH CONFIG, when you want to select MATV/CATV/FREQ/BLANK(or Deletion),
- (4) When you enter name in the GLOBAL CONFIG or when you change a big English letter to a small English letter, and vice versa in the file directory,

**4] SCAN MODE BUTTON**

- (1) When you want to scan all active signal levels,
- (2) When you want to save all active signal levels in a file,

**5] CONFIG MODE BUTTON**

When you want to change and set parameters in connection with all measurement modes,

**6] SUB-FUNCTIONS SUPPORT BUTTON**

When you want to activate various sub-functions,

**7] POWER BUTTON**

When you want to turn power on or off,

**8] LCD BACKLIGHT/RESET BUTTON**

- (1) When you want to turn LCD backlight on or off,
- (2) When you want to initialize some parameters as below,

**9] ENTER BUTTON**

It is used for various functions and depended on the measurement operations. Refer to Chap. 3 Applications.

**10] ALPHA-NUMERIC-ARROW BUTTONS**

These buttons perform their own functions as well as other functions. Refer to Chap. 3 Applications.

! IMPORTANT : KEEP IN MIND!!!

If you press  button for more than 2 seconds, the following parameters will be initialized as same as factory default settings.

- (1) Level unit ▷ dB μ V
- (2) The item of Audio Measure in the CH/FREQ/MEM CONFIG ▷ Direct
- (3) Level indication in the scan mode ▷ LEVEL ONLY
- (4) Reference level in the scan mode ▷ 60dB μ V
- (5) Frequency of FREQ measurement band ▷ 250MHz
- (6) Span of frequency spectrum analyzer ▷ 11MHz
- (7) Initial display ▷ MATV measurement band
- (8) LCD contrast level ▷ 3
- (9) English letter ▷ Big English letter



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1-4. Installation

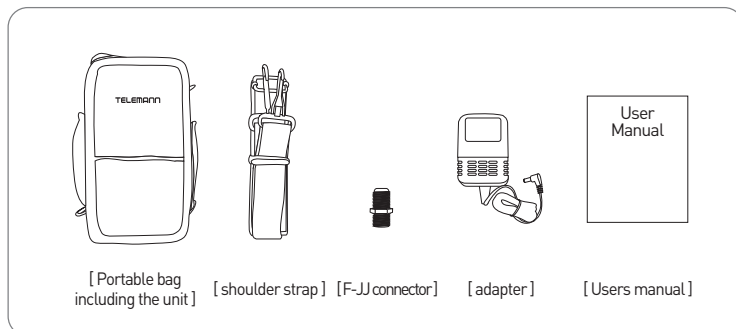
1. Check out a packing status.

- Every unit should be passed quality test at manufacturer's factory before delivery.

2. Unpack a packing box.

- If a packing box was damaged during transportation, contact to the dealer or service center promptly. In this case, keep the damaged packing box as it was, so that we can grasp the point of problem correctly. We will try to solve it fast and correctly.

3. Check out if the following things are included in a packing box correctly.



- If anything is missed, contact to the dealer or Teleman.

4. Connect the adapter to the unit in order to charge/recharge the batteries.

- 2packs(8ea.) of Ni-MH rechargeable batteries(total 9.6V) are putted into the back of the unit.

5. After charging, connect F-JJ connector to the unit.

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6. Connect a coaxial cable to the F-JJ connector.

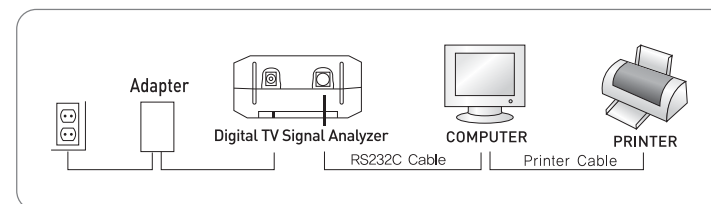
7. Press the power button().

Then, the following display will appear on the LCD screen for a while and it will be changed to the display of MATV measurement band soon. It is called the initial display.

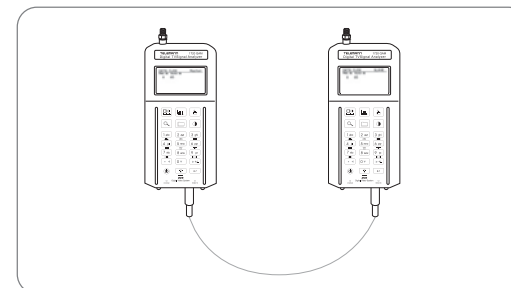


When this display appears on the screen, press the power button continuously to stop the screen.

- If data transfer to a computer or printer is necessary, connect RS232 cable to a computer or printer as below;



- If cloning function is necessary, connect two units using a cloning cable as below;



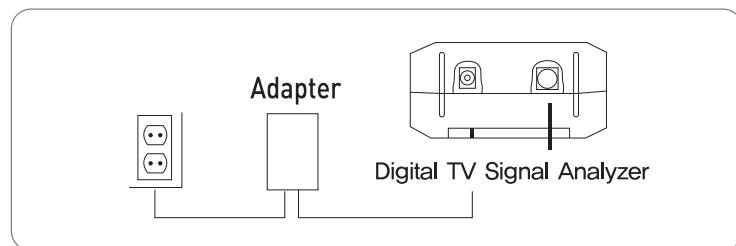


1-5. Charging Battery

1. All Telemann's units can interrupt improper power supply in order to protect their inner circuits from any possible damage.
 - Please turn the damaged unit to our A/S as the fuse should be replaced. In this case, repairing cost is charged to buyer regardless of the warranty period.
2. It is recommended to charge battery with power being turn off. In case of emergency, however, with its function protecting any damage from overcharge, charging battery during operation is possible.
 - In this case, we, Telemann, are not responsible for any damage that may happen.
3. After discharging completely, it takes for more than 8-hours to fully recharge batteries. In case of emergency, however, you can operate the unit after a 2-hour recharge as it has the fast charging function that makes the batteries recharged up to 60% within two hours.
 - The charging time of batteries depends on the battery status.
4. The unit has a the battery voltage measurement function.
[See page 41 in Chap 3. Applications]
5. The battery charge level is shown on the bottom left of the LCD screen.



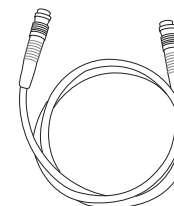
When the battery charge level becomes low(), you should recharge the batteries. If the battery charge level becomes exceedingly low, the unit will automatically power off.



1-6. Cable Specifications

There are three cables associated with the operation of Telemann's digital TV signal analyzers as below;

- 1) Coaxial Cable : option
: It is connected between F-JJ connector of the unit and the adapter of line to be measured.
- 2) RS232C interface cable : option
: Data transfer cable to a computer or printer
- 3) Cloning Cable : option
: It is used for cloning.



[coaxial cable]

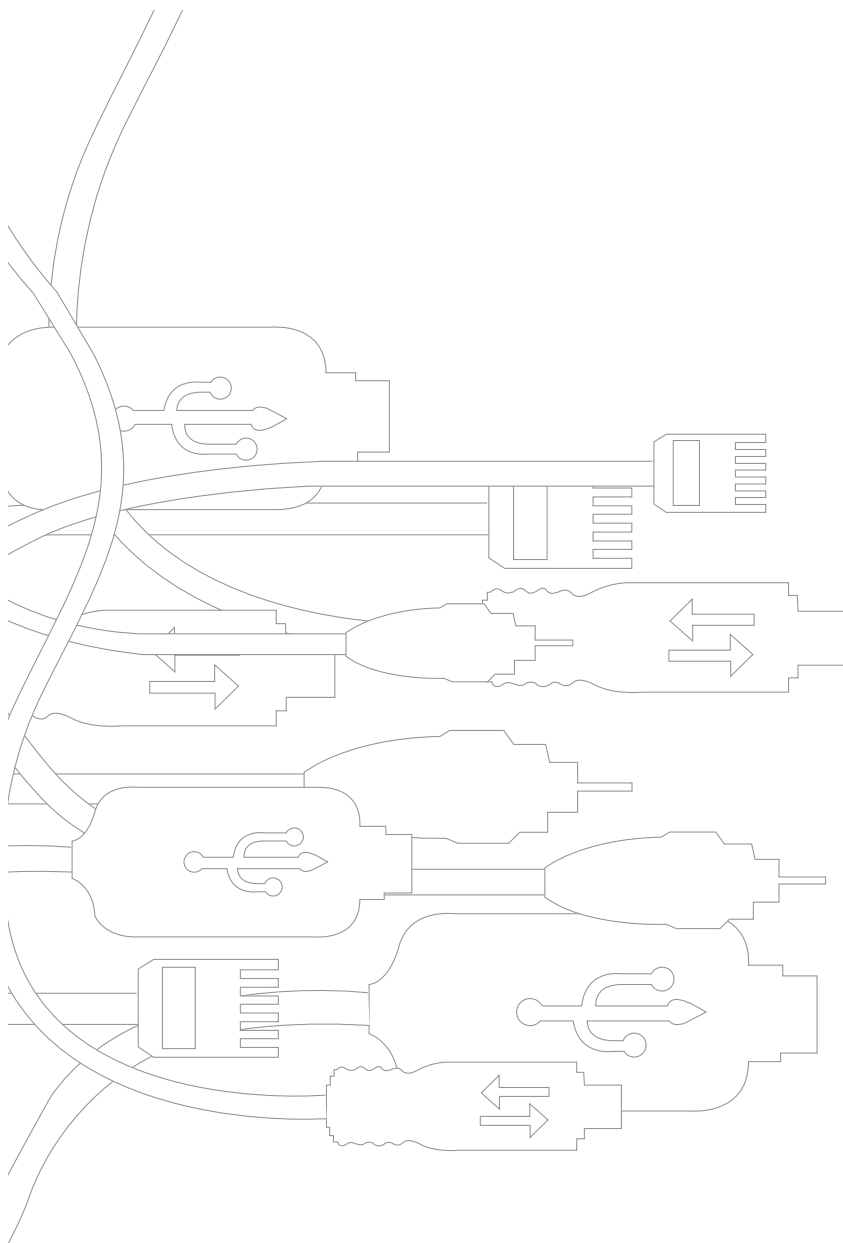


[RS232C cable]



[cloning cable]

If any problem happens, contact to the dealer or Telemann and in case of emergency, call at 82-32-678-8566/8567(overseas), 032-678-8566/8567 (domestic) or email to info@telemannco.com. We will try to solve the problem fast and correctly.



TELEMANN USERS MANUAL DIGITAL TV SIGNAL ANALYZER

Chapter 2. Basic Operations

- 2-1. How to select measurement band
- 2-2. How to select measurement mode for analog channels
- 2-3. How to select measurement mode for digital channels
- 2-4. How to enter channel number or frequency
- 2-5. How to select channel number or frequency
- 2-6. How to change level measurement unit
- 2-7. How to select spectrum analyzer modes
- 2-8. How to select scan modes
- 2-9. File(Saving/Reviewing/Printing/Deleting Measurement Files)
- 2-10. How to select configuration modes

These example measurements are designed to acquaint the first user with Telemann Digital TV signal Analyzers. They provide a foundation for understanding how to use Telemann Digital TV signal Analyzers. For a more complete overview of the unit and its capabilities, refer to Chap. 3 Application of this user manual.

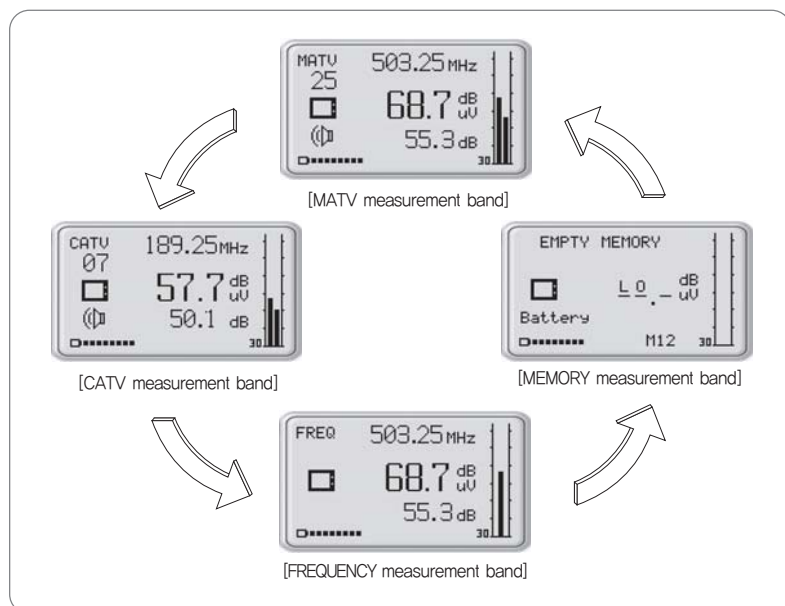


2-1. How to Select Measurement Band

Measurement bands divided into the followings. :

- (1) MATV measurement band
: If you want to measure MATV channels, measure them in this band.
- (2) CATV measurement band
: If you want to measure CATV channels, measure them in this band.
- (3) FREQ(Frequency) measurement band
: If you want to measure any frequency like FM signal, measure it in this band.
- (4) MEMORY measurement band
: If you want to measure any channel and/or frequency, you can store maximum 30 channels and/or frequencies in MEMORY CH CONFIG, which can be measured in this band.

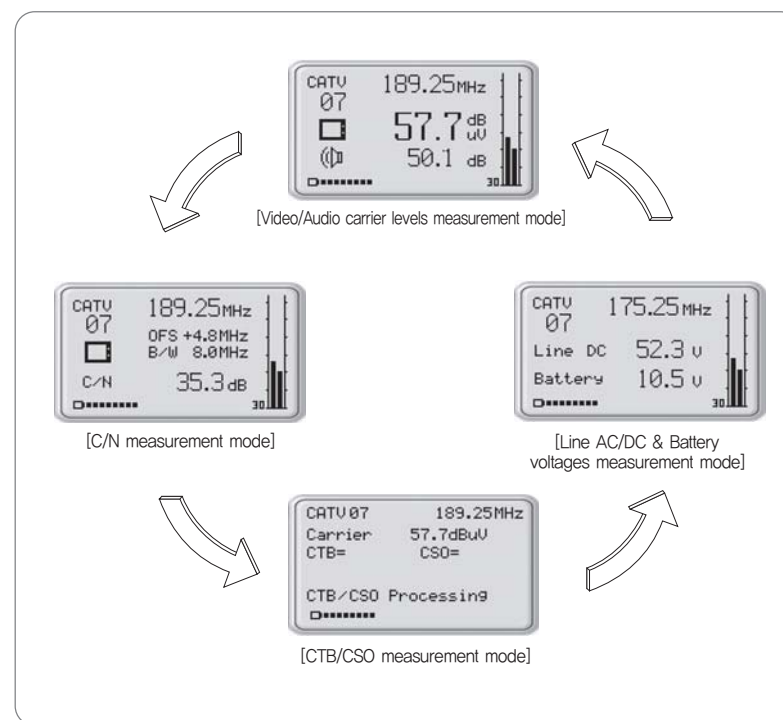
Press  button repeatedly, and measurement bands will appear on the screen as below;



2-2. How to Select Measurement Modes for Analog Channels

1. Press  button to select measurement band.
2. Press  button to select measurement mode. Then, the selected measurement modes will appear on the screen, however, they will appear differently whether a channel or frequency set as digital or analog.

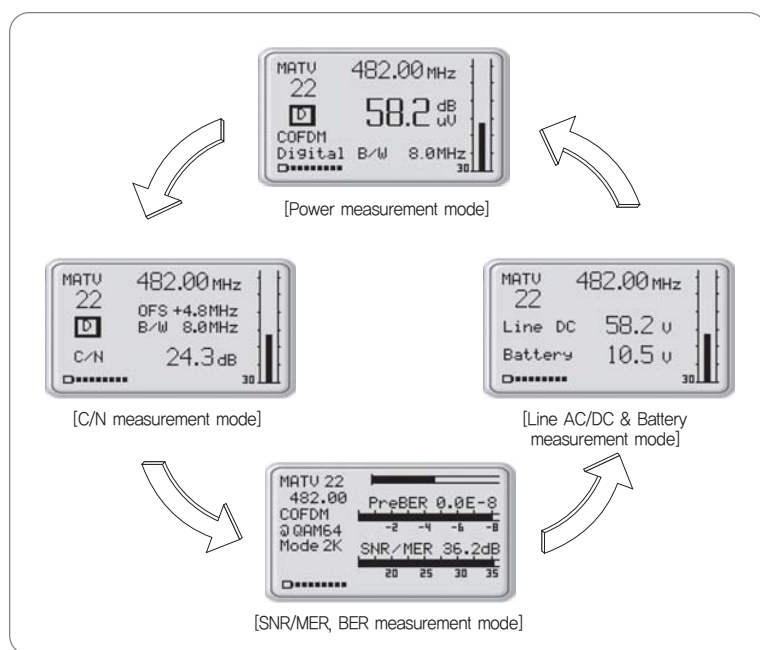
The icon, , on the screen means that the channel or frequency set as analog.





2-3. How to Select Measurement Modes for Digital Channels

The icon, **D**, on the screen means that the channel or frequency set as digital.



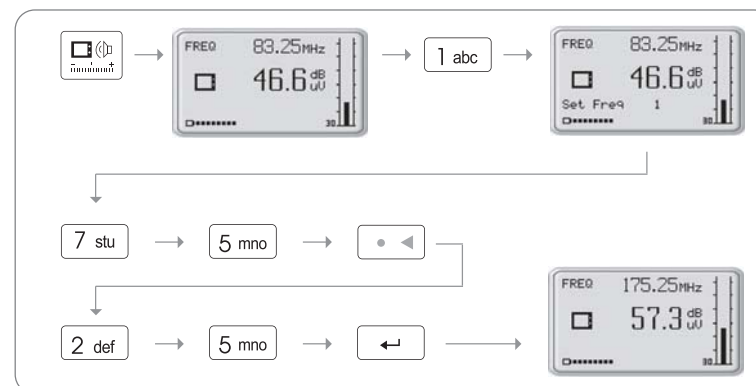
NOTE!!!

1. SNR/MER, BER measurement mode will appear on the screen, but they will not work actually in model 1702 and 1703.
2. In order to set the channel or frequency as analog or digital, see pages, 42/62/66 in Chap. 3 Applications.

2-4. How to Enter Channel Number or Frequency

Press button to select the measurement band and enter the channel number or frequency that you want to measure. The message, Set CH No. or Set Freq will appear together with the entered channel number or frequency on the bottom of screen. To terminate the entry, press button.

★ Example : If you want to enter 175.25MHz in FREQ measurement band, press buttons as follows;



[How to enter the alphabet channels]

- 1) CCIR channel plan
 - 1101 ~ 1109 / 110 ~ 141 → S01 ~ S09 / S10 ~ S41
 - 201 ~ 204 → T1 ~ T4 ○ 301 ~ 302 → Z1 ~ Z2
 - 401 / 402 / 403 → X/Y/Z
- 2) EIA channel plan
 - 201 ~ 204 / 211 ~ 215 → D1 ~ D4 / D11 ~ D15

Example : Channel S01 in CCIR channel

1 abc 1 abc 0 ▼ 1 abc
→ S01

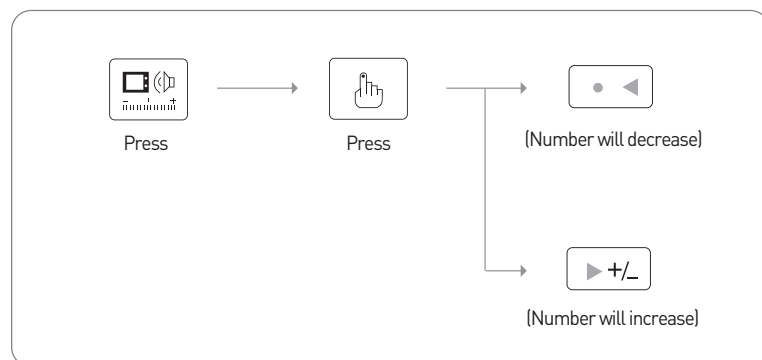
NOTE!!!

You can also enter memory number in MEMOY measurement band using the same method mentioned above. In this case, however, you must enter channel and/or frequency that you want to measure in the MEMORY CH CONFIG first. [See page 42 in Chap 3 Applications.]



2-5. How to Select Channel Number or Frequency

In order to select the channel number or frequency, press buttons as follows.



NOTE!!!

1. If you press button or button once, channel number or frequency will decrease or increase one by one.
And also, if you hold down these buttons continuously, channel number or frequency will decrease or increase very fast.
2. In MEMORY measurement band, you can select the desired memory number using the same method mentioned above.
In this case, however, you must enter channel and/or frequency that you want to measure in the MEMORY CH CONFIG first.
(See page 42 in Chap.3 Applications)

2-6. How to Change Level Measurement Unit

You can change level measurement unit as below;

1. In Video/Audio carrier levels measurement mode,

: Press and buttons in order.

When button is pressed repeatedly, the level measurement unit will be changed to $\text{dB}\mu\text{V} \rightarrow \text{dBmV} \rightarrow \text{dBm}$ in turn.

The level measurement unit set as $\text{dB}\mu\text{V}$ at the factory.

2. In GLOBAL CONFIG mode

: See page 57~58 in Chap. 3 Applications.



2-7. How to Select Spectrum Analyzer Modes

There are three spectrum analyzer modes as follows.

(1) Channel spectrum analyzer mode

: It shows status of both video and audio carrier levels of all active channels in one screen.

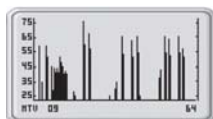
(2) Frequency spectrum analyzer mode

: On the basis of the entered channel's frequency by the user, this mode shows its video carrier level and enlarge/reduce the range of its span.

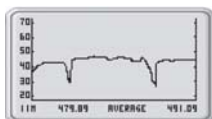
(3) Tilt spectrum analyzer mode

: To activate this mode, the user must save channel or frequency into the TILT CHANNEL LIST first, in where max. 15 channels or frequencies can be entered. It arranges the lowest frequency on the left and the highest one at the right in the screen, regardless the orders of entering channels and/or frequencies into the TILT CHANNEL LIST and also, display the difference between those of video levels at the bottom of screen that is called "TILT SLOPE" as well.

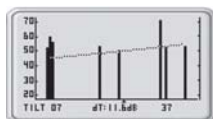
In order to select spectrum analyzer modes, press button repeatedly. Channel spectrum analyzer mode, frequency spectrum mode and tilt spectrum analyzer mode will appear on the screen.



[Channel Spectrum Analyzer]



[Frequency Spectrum Analyzer]



[Tilt Spectrum Analyzer]

NOTE!!!

1. In order to show tilt spectrum analyzer mode on the screen, you must enter channel or frequency in the TILT CHANNEL LIST first. (See page 48 in Chap. 3 Applications)
2. When FREQ measurement band is selected, channel spectrum analyzer mode can't be seen on the screen.

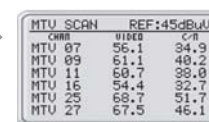
2-8. How to Select Scan Modes

There are four scan modes as follows. : MTV SCAN mode, CTV SCAN mode, MEM SCAN mode, TILT SCAN mode

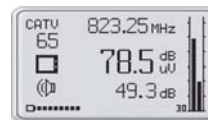
In order to select scan modes, press button.
The selected scan mode will appear as below;



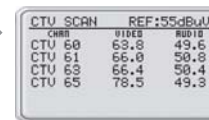
[MATV measurement band]



[MTV scan mode]



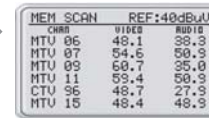
[CATV measurement band]



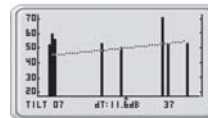
[CTV scan mode]



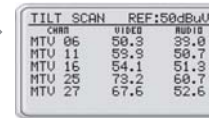
[MEMORY measurement band]



[MEM scan mode]



[TILT spectrum analyzer mode]



[TILT scan mode]



2-9. File

2-9-1. How to save measurements

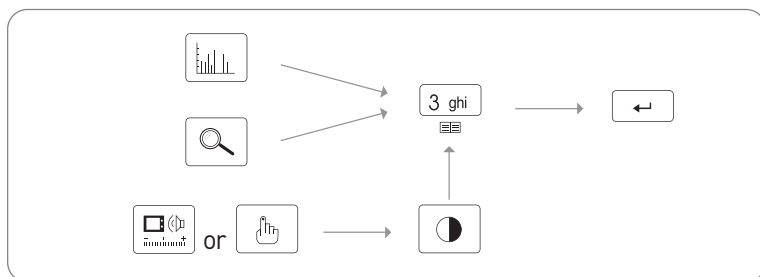
In spectrum analyzer modes or scan modes, you can save measurements by pressing **2 def** button. You can make a file and it will be added into the file directory.



2-9-2. How to review/delete/print measurement files

In order to review measurement files, you have to accede the file directory first by pressing **3 ghi** button in spectrum analyzer modes or scan modes and also, press **3 ghi** and **3 ghi** buttons in order in level measurement modes.

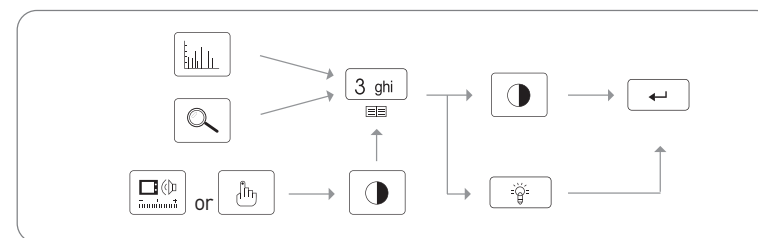
Then, you select the wanted file pressing **8 wnx** or **0 ▼** button and press **↵** button. The saved measurement data including the selected file will appear on the screen.



In order to delete measurement file(s), you have to open the file directory first as mentioned above.

Then, if you want to delete one file, you select it pressing **8 wnx** or **0 ▼** button and press **↵** and **↵** buttons in sequence.

If you want to delete all files at once, press **☼** button for more than 2 seconds. The warning message will appear on the screen. If you want to delete all files surely, press **↵** button.



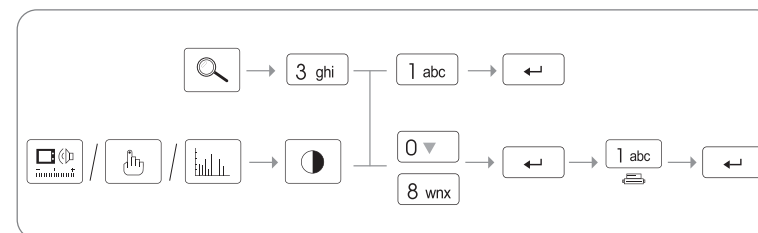
You can print all files at once or one file. Open the file directory first. If you want to print all files at once, press **1 abc** button.

"Print All?" message is appeared on the screen and press **↵** button.

If you want to print one file, press **8 wnx** or **0 ▼** button to select the file and then, press **↵** button to open the selected file.

Press **1 abc** button, and "Print Now" message is appeared.

Press **↵** button for printing.



Before printing, please check the followings!!

1. Connect your computer with printer.
2. Connect the unit to your computer using RS232C cable.
3. Install the Telemann software, TC-05 at your computer.
4. Adjust the communication parameters of your computer or printer to those of TC-05.

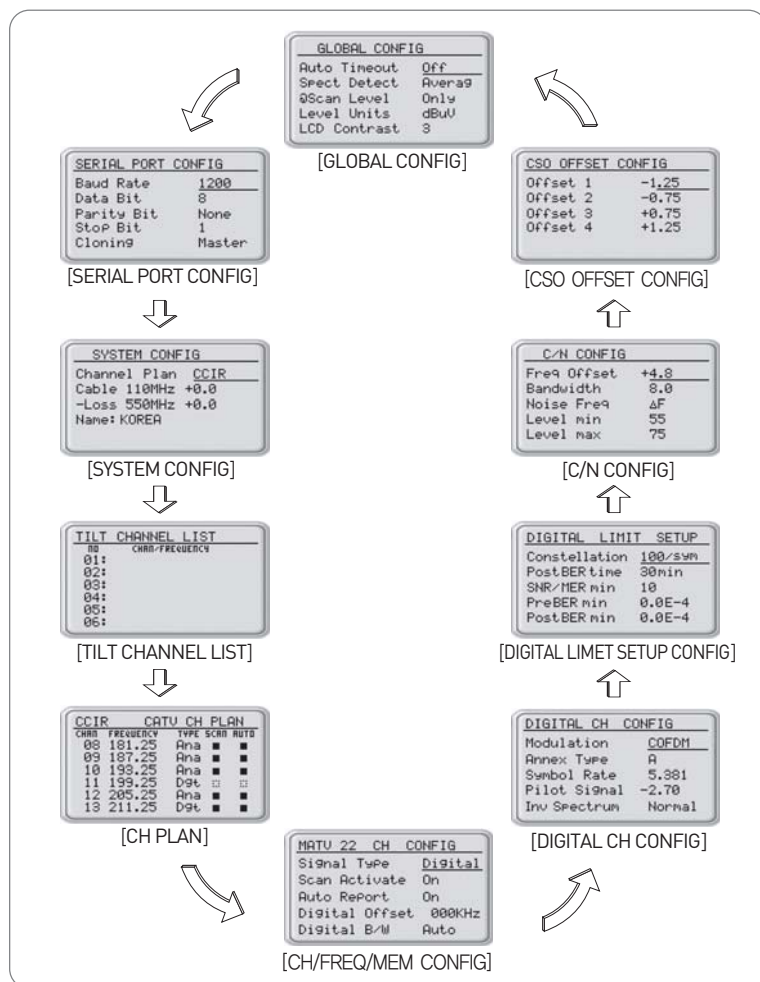


TELEMAN

2-10. How to Select Configuration Modes

Press button repeatedly, and configuration modes will appear on LCD screen in turn.

Press button and next, button to return to a previous screen.



TELEMAN USERS MANUAL DIGITAL TV SIGNAL ANALYZER

Chapter 3. Applications

- 3-1. Level measurement modes for analog channels
 - 3-1-1. Video/Audio carrier levels measurement mode
 - 3-2-2. Carrier to Noise(C/N) measurement mode
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- 3-2. Level measurement modes for digital channels
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- 3-8. Configuration modes

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- 3-8-3. System Config mode
- 3-8-4. Channel/Frequency/Memory Config mode
- 3-8-5. Digital CH Config mode
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- 3-8-8. Channel Plan
- 3-8-9. Digital Limit Setup

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- 3-10. Cloning

This chapter provides detailed operations of Digital TV signal Analyzers. It includes the detailed examples the various displays of the selected modes of operation.



3-1. Level Measurement for Analog Channels

3-1-1. Video/Audio Carrier Levels Measurement Mode

You can measure both video and audio carrier levels for the selected channel in this video/audio level measurement mode and see the ratio between video and audio levels as well.

Press buttons	Displays
 → 	 [Video/Audio Carrier Levels Measurement Mode]
 →  → 	 [Ratio between Video and Audio Carrier Levels]

◆ Information shown on the displays...

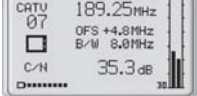
- Ⓐ measurement band(shown as CATV on the displays)
- Ⓑ channel number(shown as 07 on the displays)
- Ⓒ analog type(shown as  on the displays)
- Ⓓ video/audio carrier levels measurement mode(shown as  on the displays)
- Ⓔ battery status (shown as  on the displays)
- Ⓕ frequency(shown as 189.25MHz on the displays)
- Ⓖ video carrier level(shown as 57.7dB μ V on the displays)
- Ⓗ audio carrier level(shown as 50.1dB on the upper display)
- Ⓘ V/A ratio(shown as Δ -7.6dB on the lower display)
- ⓲ bar graph(The left bar graph shows video carrier level and the right one shows audio carrier level.) : 10dB μ V/10dBmV/10dBm unit per division

! NOTE!!!

- In order to see V/A ratio, press  button. It will appear at the place of Ⓗ like Δ -7.6 dB as shown in the lower display.
- V/A ratio can be set in CH/FREQ/MEM CONFIG as well.
(See page 61~62 in Chap. 3 Applications)

3-1-2. Carrier to Noise(C/N) Measurement Mode

C/N ratio can be measured when video level is over 50dB and you can set parameters in connection with C/N ratio measurement mode in C/N CONFIG mode.

Press buttons	Display
 → 	 [C/N Ratio Measurement Mode]

◆ Information shown on the display..

- Ⓐ measurement band(shown as CATV on the display)
- Ⓑ channel number(shown as 07 on the display)
- Ⓒ analog type(shown as  on the display)
- Ⓓ C/N ratio measurement mode(shown as C/N on the display)
- Ⓔ battery status(shown as  on the display)
- Ⓕ frequency(189.25MHz on the top display)
- Ⓖ frequency offset(shown as OFS 4.8MHz on the display)
- Ⓗ noise measurement bandwidth(shown as B/W 8.0MHz on the display)
- Ⓘ bar graph(The left bar graph shows video carrier level and the right one shows audio carrier level.) : 10dB μ V/10dBmV/10dBm unit per division

! NOTE!!!

In order to set parameters in connection with C/N ratio measurement mode such as frequency offset, noise measurement bandwidth, noise frequency, access to the C/N CONFIG.

C/N CONFIG	
Freq Offset	+4.8
Bandwidth	8.0
Noise Freq	Δ F
Level min	55
Level max	75



3-1-3. CTB/CSO Measurement Mode

■ What CTB and CSO are..

In order to help user's understanding, we explain what CTB and CSO are briefly and then, their measurement methods.

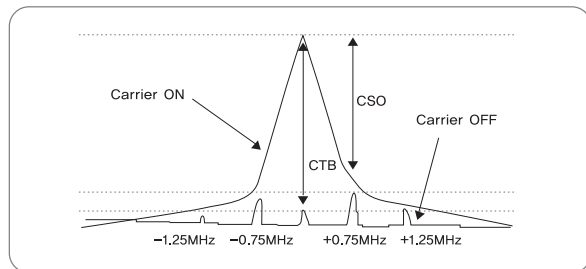
Amplitude distortion occurs in a system, subsystem, or device when the output amplitude is not a linear function of the input amplitude.

Main factors for the signal distortion that is made by such amplitude distortion are CSO(Composite Second Order) and CTB(Composite Triple Beat). Such CSO and CTB distortions appear within a certain frequency and cause the beat interference on the TV display.

Composite Triple Beat(CTB) is a commonly encountered manifestation of coherent noise. When it appears, it normally signifies that somewhere between the signal source and the subscriber, an amplifier is being overdriven. The CTB impairment is caused by the cumulative effect of hundreds of third order intermodulation beat products. Graininess or a similar texture effect characterizes this impairment over the entire picture, which appears as a tearing in the horizontal lines of the screen.

Composite Second Order beats (CSO) are also resulted from nonlinear behavior in electronic components. In cable systems the source is most frequently the laser drivers for optical fiber links, and sometimes the optical fiber itself. CSO is less frequently encountered in coaxial cable amplifiers due to the widespread use of what are called push-pull amplifiers, which usually relegates CSO to lesser significance than CTB.

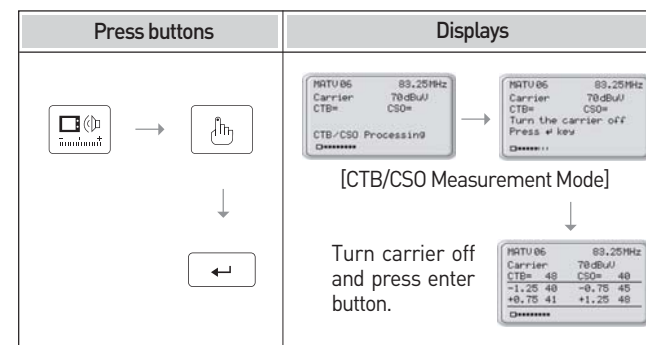
A CSO beat is a cluster of hundreds of second order single frequency inter-modulation products. Grainy texture or diagonal lines can be occurred over the entire picture.



Telemann Digital Signal Analyzers define and display the worst measurement value accompanied with the frequency offset as CSO value.(Namely, the CSO value has minor value.)

The CTB measurement is performed accordingly to the CSO. If all transmitted channels have the video carrier at the same position within the channel, then the CTB beat will show up at the same frequency as the video carrier. That's why the carrier of channel should be turn off.

■ How to measure CTB/CSO values



! NOTE!!!

In order to set offsets in connection with CSO measurement, access to the CSO OFFSET CONFIG.(See page 64~65 in Chap. 3 Applications)

CSO OFFSET CONFIG	
Offset 1	-1.25
Offset 2	-0.75
Offset 3	+0.75
Offset 4	+1.25



3-2. Level measurement for digital channels

3-2-1. Power Measurement Mode

Teleman Digital TV Signal Analyzers measure the average power within the digital channel bandwidth. In addition, when channel set as digital, its own frequency is changed to the center frequency, which will display on the screen.

■ How to measure digital channel power

1. To change digital bandwidth, access to the CH/FREQ/MEM CONFIG by pressing button repeatedly. (See page 61~62 in Chap. 3 Applications)
2. To change modulation type(@), annex type, symbol rate and spectrum inversion, access to the DIGITAL CH CONFIG by pressing button repeatedly. (62~64. in Chap. 3 Applications)

For example, when Channel 25 is defined as digital in the CH PLAN or CH CONFIG and the modulation type is set as QAM64 in the DIGITAL CH CONFIG, press button repeatedly. The following will appear on the screen.



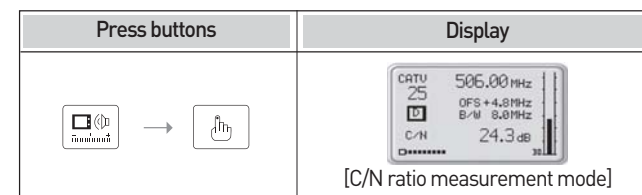
[Example : Digital Channel Average Power Measurement - QAM64]

◆ Information shown on the display..

- Ⓐ measurement band(shown as CATV on the display)
- Ⓑ channel number(shown as 25 on the display)
- Ⓒ digital type(shown as **D** on the display)
- Ⓓ modulation type(shown as QAM64 on the display)
- Ⓔ digital bandwidth(shown as 8.0MHz on the display)
- Ⓕ battery status(shown as on the display)
- Ⓖ frequency(shown as 506.00MHz on the display)
- Ⓗ video carrier level(shown as 58.4dB μ V on the display)
- Ⓘ bar graph(It shows video carrier level.)
: 10dB μ V/10dBmV/10dBm unit per division

3-2-2. Carrier to Noise(C/N) Measurement Mode

In level measurement mode for digital channel, C/N ratio shows the ratio between digital channel average power and noise power. It can be measured when video level is over 40dB.



◆ Information shown on the display..

- Ⓐ measurement band(shown as CATV on the display)
- Ⓑ channel number(shown as 25 on the display)
- Ⓒ digital type(shown as **D** on the display)
- Ⓓ modulation type(shown as QAM64 on the display)
- Ⓔ C/N ratio measurement mode(shown as C/N on the display)
- Ⓕ battery status(shown as on the display)
- Ⓖ frequency(shown as 506.00MHz on the display)
- Ⓗ frequency offset(shown as OFS 4.8MHz on the display)
- Ⓘ noise measurement bandwidth(shown as B/W 8.0MHz on the display)
- Ⓚ ratio between digital channel power and noise power
(shown as 24.3dB on the display)
- Ⓚ bar graph(It shows video carrier level)
: 10dB μ V/10dBmV/10dBm unit per division

! NOTE!!!

1. In order to see video carrier level, press button.
It will replace in the figures of Ⓗ and Ⓘ on the screen.
2. In order to set parameters in connection with C/N CONFIG such as frequency offset and noise measurement bandwidth, access to the C/N CONFIG by pressing button. (See page 60.)

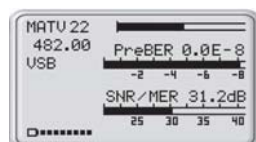
C/N CONFIG	
Freq Offset	+4.8
Bandwidth	8.0
Noise Freq	dB
Level min	55
Level max	75



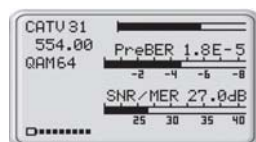
3-2-3. SNR/MER, Pre-BER, Post-BER, Constellation Diagram

You have to set modulation type, annex type, symbol rate, spectrum inversion as same as your measurement conditions and the channel or frequency as digital type before measuring SNR/MER, Pre-BER, Post-BER, Constellation diagram.

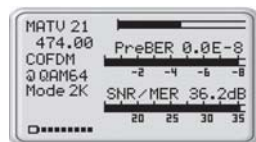
Then, press  button till Pre-BER, SNR/MER measurement mode appear on the LCD screen. The following displays are examples of Pre-BER, SNR/MER measurement mode when modulations are selected as VSB, QAM64, COFDM, respectively.



[Pre-BER, SNR/MER Measurement Mode : VSB mode]

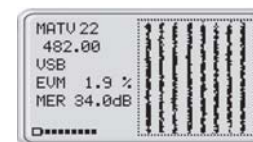


[Pre-BER, SNR/MER Measurement Mode : QAM64 mode]

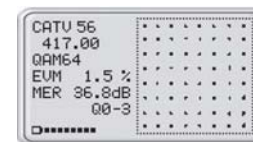
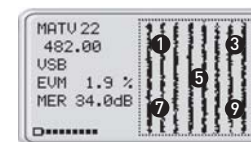


[Pre-BER, SNR/MER Measurement Mode : COFDM mode]

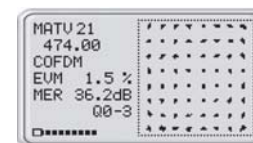
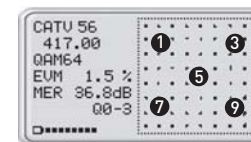
If you want to display constellation diagram, press  button, and this will be appeared on the LCD screen like the following;



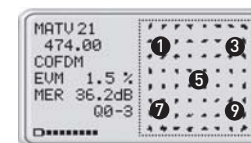
[VSB Constellation Diagram]



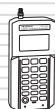
[QAM Constellation Diagram]



[COFDM Constellation Diagram]



- 1) In order to zoom the upper left area(①), press  button.
- 2) In order to zoom the upper right area(③), press  button.
- 3) In order to zoom the lower left area(⑦), press  button.
- 4) In order to zoom the lower right area(⑨), press  button.
- 5) In order to zoom the center area(⑤), press  button.



If you press **5 mmo** button one more time the original constellation diagram will be displayed.

6) In order to restart Pre-BER, SNR/MER measurement as well as Constellation diagram, press **☐** two times.

If you want to see VSB/QAM/COFDM parameters, press **←** button, and the following display will appear on the LCD screen.

Mod 8 USB Terrestrial
SR 5.381 Spect Norm
AGC 0167 Carrier 0
Equalize 0 Frame 0
EVM 2.7 % MER 31.0dB
PER 0.0E-8 Post 0.0E-8
Real Err 0.00E0 00:05

[VSB Parameters]

Mod QAM64 Annex A/C
SR 4.363 Spect Norm
AGC 0060 Carrier 0
Equalize 0 Frame 0
EVM 4.4 % MER 27.0dB
PER 2.4E-5 Post 0.0E-8
Real Err 0.00E0 00:03

[QAM Parameters]

Modur QAM64 Mode 8K
Guard 1/32 Code 5/6
Alpha 0 Spect Norm
AGC 139 Btb 0 Rsol 0
EVM 1.8 % MER 33.8dB
Pre 3.3E-8 Post 0.0E-8
Real Err 0.00E0 00:10

[COFDM Parameters]

Digital Signal Measurement	
MER (Modulation Error Rate)	* Measurement Range - VSB : 15 ~ 37dB(±2dB) - 64QAM : 22 ~ 37dB(±2dB) - 256QAM : 28 ~ 37dB(±2dB) - COFDM : up to 37dB(±2dB) * Max. displayed SNR/MER is about 34dB on the portable type analyzer.(Typical)
BER (Bit Error Rate)	* 1720/1730QAM & 1720/1730QAM(A) →10E -2 to 10 E-9 * Other Models : 10E -2 to 10 E-8
EVM (Error Vector Magnitude)	* Measurement Range : 1.5% ~ 8.0%
Lock Range	* 1720/1730 VSB/QAM, 1720/1730 OFDM : 45dBμV(-15dBmV) ~ 120dBμV(+60dBmV) * 1720/1730 QAM : 50dBμV(-10dBmV) ~ 120dBμV(+60dBmV)
Data Logger	Level-MER, Level-BER

[Typical SNR/MER Results]

Grade	SNR/MER		
	QAM64	QAM256	VSB
VeryExcellent	36	37	34
Excellent	35	36	32
Good	31	34	28
Acceptable	28	31	22
Marginal	24	29	19
Dangerous	22	28	18

3-3. Line AC/DC & Battery Voltages Measurement Mode

You can check line AC/DC & Battery voltages regardless of analog or digital channel.

Press buttons	Display
→	line voltage battery voltage [Line AC/DC & Battery Voltages Measurement Mode]

■ Line AC/DC voltage

Measuring range is AC/DC 10V~110V. The unit is designed to identify input voltage polarity and AC/DC automatically. If AC voltage is merged into DC voltage in duplicate, the larger level is displayed. Please be aware of this feature.

■ Battery voltage

This is an extra option to measure the battery voltage in addition to the battery level meter displayed at the bottom of LCD screen.

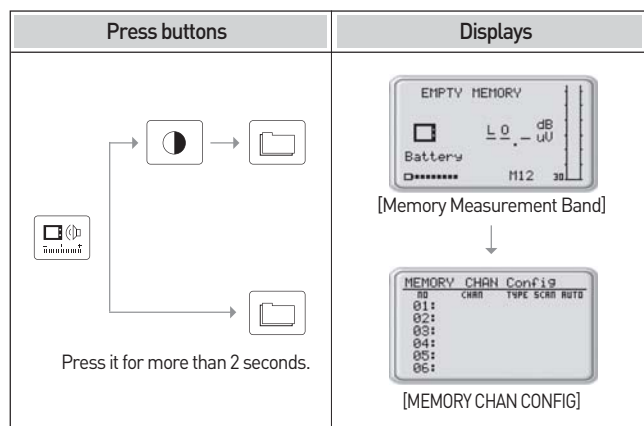
The level for battery voltage is displayed together with line AC/DC voltage in the same screen. Measuring range is 8V~15V. To avoid any problem, it is recommended to use 2packs of Ni-MH rechargeable batteries(4.8V, 2,100mAh) composed of 4 cells attached to the unit.



3-4. Memory Measurement Band

3-4-1. Accessing to MEMORY CHAN CONFIG

Teleman unit has a unique measurement band, allowing users to save and measure maximum 30 channels and/or frequencies. To use this function, you have to save your desired channel or frequency in MEMORY CHAN CONFIG first and then, measure it in MEMORY measurement band.



3-4-2. How to Enter Channel and/or Frequency

◆ Information shown on the display..

- ① MEMORY CHAN CONFIG
- ② memory number(NO on the display)
- ③ measurement band together with channel or frequency (CHAN on the display)
- ④ analog or digital type(TYPE on the display)
- ⑤ scan activate/inactivate (SCAN on the display)
- ⑥ remote mode activate/inactivate (AUTO on the display)



[MEMORY CHAN CONFIG]

■ To enter channel or frequency..

1. Press  button.
: You can enter MTV → CTV → FREQUENCY → BLANK(DELETION) will appear at the place of ③ in sequence.
2. Press your desired numeric button to enter numeric numbers.
: When you enter frequency and need a decimal point, press  button.
3. Press  and  or  or  button.
: One column or rank will move to left/right/up/down, respectively.
4. Press  and  or  button.
: Six columns or ranks will move to up/down, respectively.

! NOTE!!!

After entering your desired channel and/or frequency in MEMORY CH CONFIG, press  button to measure the entered channel or frequency in MEMORY measurement band.



3-5. Spectrum Analyzer Modes

3-5-1. Common Operations

As mentioned on page 26 in Chap. 2 Basic Operations, there are three spectrum analyzer modes : Channel Spectrum Analyzer Mode, Frequency Spectrum Analyzer Mode and Tilt Spectrum Analyzer Mode. The followings are common operations applying to all spectrum analyzer modes.

1. What is the level measurement unit?

$\text{dB}\mu\text{V}$

2. How to adjust the reference level? What is the automatic reference level setting function?

The highest one among the measured channel levels will be set as the reference level automatically and it will be shown at the top left on the screen. This is called "Automatic Reference Level Setting Function".

· Press $\boxed{8 \text{ wnx}}$ or $\boxed{0 \nabla}$ to adjust the reference level manually.

3. How to adjust the level unit per division?

(1) $15 \sim 120 \text{ dB}\mu\text{V}$ with the unit of $5 \text{ dB}\mu\text{V}$ or $10 \text{ dB}\mu\text{V}$ per division.

(2) Press $\boxed{4 \text{ ju}}$ button to adjust the level unit per division.

4. How to see the reference line and move it?

Press $\boxed{\text{reference line icon}}$ button, and the reference line will appear on the screen.

Then, press $\boxed{8 \text{ wnx}}$ or $\boxed{0 \nabla}$ button to move it to up or down.

5. How to see the vertical line and move it?

Press $\boxed{\text{vertical line icon}}$ button, and the vertical line will appear on the screen.

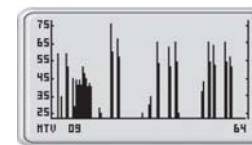
Then, press $\boxed{\leftarrow}$ or $\boxed{\rightarrow + \text{L}}$ button to move it to the left or right, respectively.

3-5-2. Channel Spectrum Analyzer Mode

When MATV or CATV or MEMORY measurement band is selected, press



button one time, Channel Spectrum Analyzer will appear on the screen like the following display. Please note that when FREQUENCY measurement band is selected, it will not appear.



[Channel Spectrum Analyzer Mode]

(1) How to adjust Sweep Span?

The smallest channel is shown at the left bottom of screen and the largest one is shown at the right bottom of screen as above. The range between the smallest and largest channel is called "Sweep Span".

Press $\boxed{7 \text{ stu}}$ or $\boxed{9 \text{ yz}}$ button. Sweep span will be decreased or expanded.

At this time, the reference channel will be changed according to the selected sweep span.

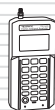
(2) How to adjust channel

When $\boxed{\leftarrow}$ or $\boxed{\rightarrow + \text{L}}$ button is pressed, channel will be decreased or increased. And when these buttons are keep pressing, channel will be decreased or increased very fast.

(3) How to display video/audio carrier levels on the screen

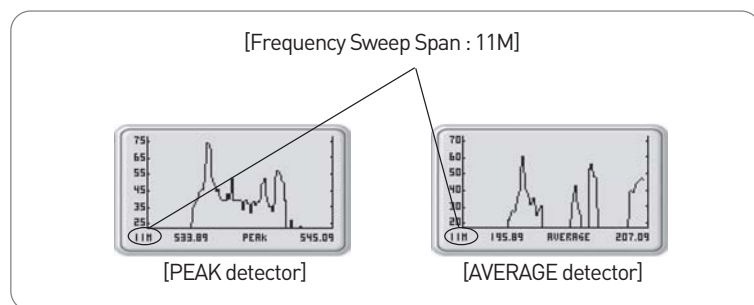
Press $\boxed{\text{carrier level icon}}$ button first. The cursor, "└" will appear at the bottom of screen.

Then, press $\boxed{\leftarrow}$ or $\boxed{\rightarrow + \text{L}}$ button. The cursor will move to the left or right and also, video carrier level, audio carrier level and channel number will appear. V and A mean video carrier level and audio carrier level, respectively. For example, 37, 37V and 37A means channel 37, video carrier level for channel 37 and audio carrier level for channel 37, respectively.



3-5-3. Frequency Spectrum Analyzer Mode

Press  button twice, and frequency spectrum analyzer will appear on the screen as follows.



(1) How to select PEAK detector or AVERAGE detector? How to adjust it manually?

In order to select Peak detector or Average detector, access to the GLOBAL CONFIG by pressing  button. (See page 57 in Chap. 3. Applications.)

However, when  button is pressed, the selected spectrum detector will be changed manually at the current LCD screen.

(2) How to adjust Frequency Sweep Span?

The frequency range that is shown at one display is called as “Frequency Sweep Span”.

Press  or  button, and the span will be reduced or expanded.

Also, press  or  button, and the frequency resolution will be changed according to the current selected span.

Display resolution varies according to the selected span as shown the following table.

Detector	Frequency Sweep Span	Display Resolution
PEAK AVERAGE	FULL	8MHz
	220MHz	2MHz
	110MHz	1MHz
	56MHz	500KHz
	22MHz	200KHz
	11MHz	100KHz
	6MHz	50MKHz
	2MHz	20KHz

(3) How to display video carrier level on the screen?

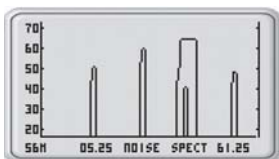
Press  button first. The cursor, “┐” will appear at the bottom of screen. Then, press  or  button to move it to the left or right, respectively.

(4) How to measure the reverse noise in CATV measurement mode?

You can measure reverse noise(Max Hold), which is transmitted from the head end system.

- 1) Press  button until CATV measurement appear on the screen.
- 2) Press the alphanumeric buttons 2, 0, 1 one by one. Then, D01 channel is displayed.
- 3) Press  button once, and the following NOISE SPECTRUM mode is displayed.

The noise spectrum range is 5.25 ~ 61.25MHz. Press  or  button. It will be changed 5.25MHz~61.25MHz or 5.25MHz~107.25MHz, respectively.



[Reverse Noise Spectrum]

3-5-4. Tilt Spectrum Analyzer Mode

In order to analyze tilt spectrum, the user must save the desired channel and/or frequency in TILT CHANNEL LIST. Max 15 numbers can be entered.

■ TILT CHANNEL LIST

Press button repeatedly, and TILT CHANNEL LIST will appear on the screen like this display.



[TILT CHANNEL LIST]

(1) How to enter channel or frequency?

Press button, and MTV → CTV → FREQUENCY → BLANK(or DELETION) will appear in sequence. Then, press numeric button(s) appropriate to your desired channel or frequency.

If a decimal point is needed for the frequency entry, press button.

(2) How to move the underline to up or down at once?

Press and then, press or button.

(3) How to move all six lines to up or down?

Press and then, press or button.

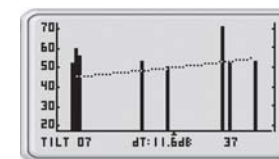
(4) How to terminate the entry of channel or frequency in TILT CHANNEL LIST?

Press button.

■ TILT SPECTRUM ANALYZER

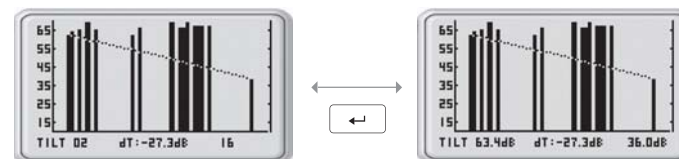
After terminating the entry of channel or frequency in TILT CHANNEL LIST, press button three times continuously.

Tilt spectrum analyzer will appear on the screen as follows. Regardless of the entry numbers in TILT CHANNEL LIST, tilt spectrum analyzer will arrange the lowest frequency at the left of display and the highest one at the right of display automatically and show the level difference between both frequencies, that is called "Tilt Slope". It is shown the middle bottom of the screen as dT:xx.xdB. For example, the tilt slope on the following display is 11.6dB.



[Tilt Spectrum Analyzer Mode]

Once you press button, the highest level and the lowest one as well as tilt slope will appear as like the light screen. If you press button again, the screen will be back to the left screen, in which tilt slope is displayed only.





3-6. Scan Modes

Scan Modes scan all channels that not only scan items are marked in CH PLAN/CH CONFIG/MEMORY CH CONFIG, but the levels over the selected reference level in scan modes as well.

There are four scan modes as below;

MTV SCAN REF:50dBuV		
CHAR	VIDEO	AUDIO
MTV 07	56.1	50.3
MTV 08	61.1	36.2
MTV 11	60.7	51.2
MTV 15	54.4	51.3
MTV 25	73.2	60.9
MTV 27	67.5	52.5

[MTV SCAN MODE]

CTV SCAN REF:50dBuV		
CHAR	VIDEO	AUDIO
CTV 07	55.3	50.6
CTV 09	61.1	38.6
CTV 11	60.5	50.7
CTV 68	53.2	48.5

[CTV SCAN MODE]

MEM SCAN REF:40dBuV		
CHAR	VIDEO	AUDIO
MTV 05	48.1	38.3
MTV 07	54.6	50.3
MTV 09	60.7	35.0
MTV 11	53.4	50.3
CTV 36	48.7	27.3
MTV 15	48.4	48.3

[MEM SCAN MODE]

TILT SCAN REF:50dBuV		
CHAR	VIDEO	AUDIO
MTV 06	50.3	39.0
MTV 11	59.3	50.7
MTV 16	54.1	51.3
MTV 25	73.2	60.7
MTV 27	67.5	52.5

[TILT SCAN MODE]

(1) How to select Scan Modes?

Please refer to page 27 in Chap. 2 Basic Operations.

(2) How to adjust the reference level?

The reference level is shown on the right corner on the screen.

Press **8 wvx** or **0 ▾** button, and you can select your desired reference level : 35dB μ V / 45dB μ V / 55dB μ V / 65dB μ V / 75dB μ V / 85dB μ V / 95dB μ V / OFF

When it is selected as "OFF", all active channels will be scanned.

The selected reference level will be also applied when you save measurements.

(See page 48.)

(3) How to select the scan items?

Press **📶** button repeatedly, and you can select one of the following scan items.

The selected scan item will be also applied when you save measurements.

(See page 48)

(1) Selected scan items : VIDEO AUDIO

CTV SCAN REF:55dBuV		
CHAR	VIDEO	AUDIO
CTV 02	63.8	49.6
CTV 03	66.0	50.8
CTV 04	66.4	50.4
CTV 05	68.3	53.8
CTV 06	66.9	52.5
CTV 99	67.6	41.8

[Video carrier level
& Audio carrier level]

MTV SCAN REF:50dBuV		
CHAR	VIDEO	AUDIO
MTV 05	54.0	-7.6
MTV 06	57.8	-23.0
MTV 11	55.6	-9.1
MTV 15D	54.0	--
MTV 16D	57.7	--
MTV 25	69.6	-13.2

[Video carrier level
& V/A ratio]

(2) Selected scan items : LEVEL PASS (3) Selected scan items : C/N MER

CTV SCAN REF:55dBuV		
CHAR	LEVEL	PASS
CTV 02	63.7	Fail
CTV 03	65.6	Pass
CTV 04	66.2	Pass
CTV 05	68.3	Pass
CTV 06	66.9	Pass
CTV 07	67.2	Pass

[Video carrier level
& Pass(or Fail)]

MTV SCAN REF:45dBuV		
CHAR	LEVEL	C/N MER
MTV 15D	60.1	26.2
MTV 16D	68.0	31.0
MTV 17D	64.9	29.1
MTV 18D	62.8	28.0
MTV 25	84.2	52.8
MTV 27	78.0	54.3

[Video carrier level
& C/N(for analog channel) or
MER(for digital channel)]

(4) Selected scan items : C/N BER

MTV SCAN REF:45dBuV		
CHAR	LEVEL	C/N BER
MTV 15D	60.1	0.0E-8
MTV 16D	68.0	0.0E-8
MTV 17D	64.9	0.0E-8
MTV 18D	62.8	0.0E-8
MTV 25	84.2	52.8
MTV 27	78.0	54.3

[Video carrier level
& C/N(for analog channel) or
BER(for digital channel)]



3-7. File

3-7-1. How to save measurements

The Saving Measurement feature allows the user to save spectrum analysis data(channel/frequency/tilt), scan measurements data, Pre-BER/SNR(MER), Constellation Diagrams and Parameter displays.

Also, as described on page 47, the selected reference level and the selected scan item in Scan Mode are also applied when users save measurements in a file.

→ Although the scan items are selected Level C/N MER or Level C/N BER, you can see video carrier level, MER, BER when the file is printed.

(1) To save spectrum analysis and scan measurements, press **[2 def]** Button.

To save Pre-BER, SNR/MER, Constellation diagram and parameter display, however, press **[1/2]** and **[2 def]** buttons while taking the measurement.

The following display will appear on the screen.

Enter file name&date

Name: _

Date: mm-dd-yy HH:MM

(2) Once a file name and date are entered, press **[↵]** button to execute the operation. Measurements will be saved as below;

SAVING FILE : MEM SCAN			
CHAN	VIDEO	AUDIO	
MTU 06	48.1	38.3	
MTU 07	54.6	50.3	
MTU 09	60.7	35.0	
MTU 11	59.4	50.3	
CTU 96	48.7	27.8	
MTU 15	48.4	48.8	

IMPORTANT!!

For example, the user can make many files with the same file name. In this case, however, their file name extensions should be different. If the file name and its extension are same, the following message will appear on the screen as below;

Digital TV Signal Analyzer USERS MANUAL

This name already
exists. Overwrite?

If the user wants to overwrite the file, press **[↵]** button. In this case, all measurements in the already existed file will be deleted at all.

If not, press other button.

(3) After finishing saving, you can review the saved measurements like this. It will appear with a buzzer sound.

REVIEW FILE : MEM SCAN			
CHAN	VIDEO	AUDIO	
MTU 06	48.1	38.3	
MTU 07	54.6	50.3	
MTU 09	60.7	35.0	
MTU 11	59.4	50.3	
CTU 96	48.7	27.8	
MTU 15	48.4	48.8	

3-7-2. How to review the saved measurements

(1) To review saved measurements, press **[1/2]** button and **[3 ghi]** button when level measurement band or level measurement mode is selected and also, **[3 ghi]** button only when the spectrum analyzer modes or the scan mode is selected. The file Directory including all measurement files is displayed as follows.

FILE DIRECTORY			
FILE NAME	TYPE	DATE	
SPECTRUM.spc	1	10-25-03	
MEM SCAN.log	10	10-25-03	
MTU SCAN.log	10	10-25-03	

[File Directory]

◆ File name extension

- ① log : scan measurement file
- ② spc : channel spectrum file
- ③ fsp : frequency spectrum file
- ④ til : tilt spectrum file
- ⑤ dgt : digital measurement file



In order to see TIME, press button, and it will appear like this.

FILE DIRECTORY			
FILE	TYPE	DATE	TIME
UM.spc		10-25-03	12:53
AN.109		10-25-03	15:23
AN.109		10-25-03	12:50

To return to the previous display, which shows file name, press it again.

(2) Use or / button to select the file to be reviewed.

Once selected, press button.

The display of measurements saved in the selected file will appear like the following display.

REVIEW FILE: MEM SCAN		
CHAN	VIDEO	AUDIO
MTU 06	48.1	38.3
MTU 07	54.6	50.3
MTU 09	60.7	35.0
MTU 11	53.4	50.3
CTU 96	48.7	27.3
MTU 15	48.4	48.3

Then, press or button once again to up or down page.

If pressed continuously, page will move to up or down very fast.

(3) In order to return to the file Directory, press button.

3-7-3. How to Delete Measurement File(s)?

(1) Open the FILE DIRECTORY as above-mentioned.

(2) To delete a measurement file, use or / button to select the file to be deleted.

Once selected, press button. The message will appear at the top of display as follows.

Delete this file?		
FILE NAME	TYPE	DATE
SPECTRUM.spc		10-25-03
MEM SCAN.109		10-25-03
MTU SCAN.109		10-25-03

If you really want to delete the selected file, press button.

(3) To delete all measurement files listed on the FILE DIRECTORY at one time, keep pressing button for more than two seconds.
The warning message will appear as follows;

Delete All files?	
If you confirm,	
Press key.	

If you really want to delete all files, press button.

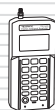
Once all files are deleted with a buzzer sound, the empty FILE DIRECTORY will appear.

To cancel, press other button, and the display will return to the original FILE DIRECTORY.

3-7-4. How to Print all files at one time or one file

(1) Open "FILE DIRECTORY".(see pages, 54-55).

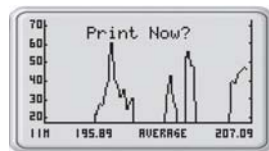
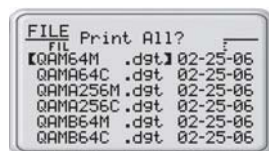
(2) If you want to print all files at one time, press button.



TELEMANN

Once "Print All?" message appears as shown as the following left screen, press button. If you want to print one file, press or button to select your desired file. Once "Print Now?" message appears as shown as the following right screen, press button.

All files or the selected file will be printed while indicator of remote mode is flashing. To cancel, press other button, and the display will return to the original FILE DIRECTORY.

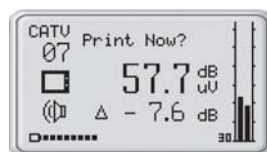


3-7-5. How to Print a Current Display in real time

The user can print the display, which is shown on the LCD screen currently, while taking measurement in level measurement mode, and spectrum analysis.

- (1) After selecting your wanted operation by pressing or button, press and buttons in sequence to print the current display.

And press only for spectrum analysis measurements. The message, Print Now? will then appear like the following display.



- (2) If you want to print it, press button.

The current display will be printed while the indicator of remote mode is flashing. If you don't want, press other button, and the message will disappear.

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Before printing, please check the followings!!

1. Connect your computer with printer.
2. Connect the unit to your computer using RS232C cable.
[See page 13 in Chap. 1 Getting Started]
3. Install the Telemann software, TC-05 at your computer.
4. Adjust the communication parameters of your computer or printer to those of TC-05.

3-8. Configuration Modes

To access the CONFIGURATION modes, press button. Whenever it is pressed repeatedly, GLOBAL CONFIG, SERIAL PORT CONFIG, SYSTEM CONFIG, CH/FREQ/MEM CONFIG, DIGITAL CH CONFIG, CSO OFFSET CONFIG, C/N CONFIG, CHANNEL PLAN, DIGITAL LIMIT SETUP(only digital signal type) will appear in turn as described on page 30 in Chap. 2 Basic Operations.

To adjust parameters, press the numeric entry buttons or arrow buttons. Also, to move the underline to up or down, press button.

Let's see CONFIGURATION modes one by one in detail.

3-8-1. GLOBAL CONFIG

The parameters for Auto Timeout, Spect Detect, Scan Level, Level Units and LCD Contrast listed on the following GLOBAL CONFIG can be adjusted.

GLOBAL CONFIG	
Auto Timeout	Off
Spect Detect	Average
Scan Level	Only
Level Units	dBuV
LCD Contrast	3

[GLOBAL CONFIG]

**(1) Auto Time-out (shown as Auto Timeout on the display)**

Auto Time-out feature turns off the unit automatically when it has remained inactive for a certain period of time to save battery life. The time out period is programmable to ; 5min, 10min, 30min, Off.

The unit can be manually turned off at any time by pressing the Power button. Use the numeric entry buttons or arrow buttons to set the time-out period. However, this Auto Timeout is not activated when charging the unit.

(2) Spectrum Detector (shown as Spect Detect on the display)

The user can select one spectrum detector among PEAK and AVERAGE. The selected spectrum detector will be applied to only Frequency Spectrum Analyzer Mode. (See pages 46~47.)

(3) Scan Measurement Level (shown as @Scan Level on the display)

The user can select the measurement level indication for all active channels in scan mode. When it is selected as "Only", "PASS", "C/N MER", "C/N BER", video & audio carrier levels, video carrier level & Pass(or Fail), video carrier level & C/N(for analog channel) or MER(for digital channel), video carrier level & C/N(for analog channel) or BER(for digital channel) in SCAN modes, respectively.

(4) Level Units

Use the numeric entry buttons or arrow buttons to select the desired level units. (dBmV, dBm, dBμV)

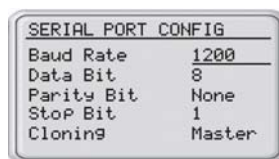
(5) LCD Contrast Level (shown as LCD Contrast on the display)

Adjust the contrast level of the LCD for optimum viewing by the operator. The level is varied on a scale from 1 to 8.

Use arrow buttons (or) to adjust the contrast level.

3-8-2. SERIAL PORT CONFIG

The parameters for Baud Rate, Data Bit, Parity Bit and Stop Bit concerning with the communication with a computer or printer as well as Cloning function listed on the following SERIAL PORT CONFIG can be adjusted.



[SERIAL PORT CONFIG]

(1) Baud Rate

It is selected among 1200, 9600, 19200, 38400. (Default : 9600)

(2) Data Bit

It is selected between 7 and 8. (Default : 8)

(3) Parity Bit

It is selected among None, Zero, Odd, Even. (Default : Even)

(4) Stop Bit

It is selected between 1 and 2. (Default : 2)

(5) Cloning

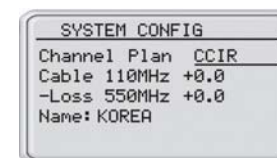
The unit transferring data is defined as Master and the other one receiving data as Slave. For more information about Cloning function, see pages 68~69.

**NOTE!!!**

Before connecting the unit to a computer, check serial ports for all communication systems and adjust parameters in SERIAL PORT CONFIG to them.

3-8-3. SYSTEM CONFIG

The parameters for Channel Plan, Cable Loss and Name listed on the following SYSTEM CONFIG can be adjusted.



[SYSTEM CONFIG]



(1) Channel Plan

8 channel plans are already stored in the unit.(CCIR, EIA and etc.)

Press the numeric entry buttons or arrow buttons to select the desired channel plan and, then press the enter button to activate the selected channel plan. Even though the channel plan is changed to other one, the measurement data in the previous channel plan will be remained in the unit.

(2) Cable Loss

Cable Loss feature is to automatically compensate the measuring errors occurred when the measuring cable has some loss or when you do measuring by connecting an impedance matching device to the input terminal.

Loss compensation function's principle is as follows:

$$\text{Compensation L} = \frac{(B - A)}{\log(Fb / Fa)} \log(Fx / Fa) + A$$

Where Fa and A are the frequency and the compensation value for 110MHz, while Fb and B are the frequency and the compensation value for 510MHz and Fx is the measuring frequency. The compensation value is automatically calculated depending on the measuring frequency as the above.

The changeable value is maximum 20dB, use the numeric buttons and press the enter button to setup per frequency.

(3) Name

The unit allows the user to enter the operator's name. The name will appear on the LCD screen when turning the unit on or in the header section of the print report.

- Use the Left/Right arrow buttons(or) to adjust/insert a character or make an empty space between two characters.
- Use the Down arrow button() to delete the desired characters.
- Use button to shift English capital letters to English small letters and vice versa.
- The insertion or adjustment of characters must be terminated by pressing the ENTER button().

- Most numeric buttons have alphabetic characters printed on them. Repeated pressing of an alphanumeric button sequences through the values printed on the button.

For example, when button is pressed repeatedly, the following alphanumeric values will be displayed on the screen in order.

D→E→F→2 or d→e→f→2

- In order to display same alphabetic or numeric value in sequence, press the desired alpha-numeric button and next, the Enter button. Then, press the alpha-numeric button again.

For example, if you want to enter "NN", please press the following buttons in order.

→ → → →

3-8-4. CH/FREQ/MEM CONFIG

The parameters for Signal Type, Scan Activate, Auto Report, Audio Measure, Digital B/W listed on the following MATV CH/CATV CH/FREQ/MEM CONFIG can be adjusted.

MATV 22 CH CONFIG			
Signal Type	Digital		
Scan Activate	On		
Auto Report	On		
Digital Offset	000KHz		
Digital B/W	Auto		

CATV S38 CH CONFIG			
Signal Type	Digital		
Scan Activate	On		
Auto Report	On		
Digital Offset	000KHz		
Digital B/W	Auto		

FREQ CH CONFIG			
Signal Type	Digital		
Scan Activate	On		
Auto Report	On		
Digital Offset	000KHz		
Digital B/W	Auto		

MEM12 CH CONFIG			
Signal Type	Digital		
Scan Activate	On		
Auto Report	On		
Digital Offset	000KHz		
Digital B/W	Auto		



(1) Signal Type

When MATV, CATV or MEMORY measurement band is selected, the signal type of currently selected channel or memorized channel showing on the LCD screen can be adjusted to analog or digital.

On the other hand, when FREQUENCY measurement band is selected, the signal type can be also adjusted to analog or digital, but this adjustment will apply to the signal type of all frequencies.

※ Users can set digital modulations up to 3 different types.

[Example] Digital1-QAM64, Digital2-QAM128, Digital3-QAM256

※ Users can set digital signal parameters for each channel or frequency at TC-05 software as well.

(2) Scan Activation On/Off (shown as Scan Activate on the display)

When MATV, CATV or MEMORY measurement band is selected, Scan activation or inactivation for the current selected channel or memorized channel can be adjusted. On the other hand, when FREQUENCY measurement is selected, Scan activation or inactivation can be also adjusted, but this adjustment will apply to all frequencies.

(3) Auto Report On/Off (shown as AUTO REPORT on the display)

This feature is option.

(4) Digital Offset (shown as Digital Offset on the display)

User can adjust the digital central frequency. (-750KHz/-500KHz/-250KHz/000KHz/+250KHz/+500KHz/+750KHz). For example, if S31 channel in CCIR channel plan is defined as the digital signal, its central frequency will be displayed as 386.00MHz. However, if this correct frequency is 386.75MHz, user has to select +750MHz of digital offset and 386.00MHz will be changed to 386.75MHz correctly.

(5) Digital Bandwidth (shown as Digital B/W on the display)

Select the digital bandwidth from 1 to 25MHz or AUTO.

[If you set it as "AUTO", 17series calculate digital bandwidth automatically according to the selected channel plan.]

3-8-5. DIGITAL CH CONFIG

The parameters for Modulation, Annex Type, Symbol Rate and Pilot Signal and Spectrum Inversion listed on the following DIGITAL CH CONFIG can be modified.

DIGITAL CH CONFIG	
Modulation	COFDM
Annex Type	A
Symbol Rate	5.381
Pilot Signal	-2.70
Inv Spectrum	Normal

[DIGITAL CH CONFIG]

(1) Modulation

Modulation type is selectable for the digital channel measurement.
: VSB, QPSK, QAM256, QAM128, QAM64, QAM32, QAM16, COFDM

(2) Annex Type

Annex Type is selectable. : A, B, C, D

(3) Symbol Rate

Symbol Rate is selectable. : 0.100M baud ~ 20.000M baud

(4) Pilot Signal

When modulation type is VSB, pilot signal is selectable from -20MHz to +20MHz.

(5) Inv Spectrum

This function does not affect model 1702/1703 but model 1720/1730 VSB/QAM, 1720/1730QAM, 1720/1730QAM(A) or 1720/1730COFDM. When these units measure SNR/MER, BER and Constellation diagram, please check whether the received digital spectrum waveform is normal or inverse. If SNR/MER, BER and constellation diagram are not measured, user should adjust spectrum inversion. Normally, the spectrum waveform of the received digital carrier is normal.

Model 1720/1730 VSB/QAM VSB/QAM(ANNEX-B) Signal Parameters		
Description	Parameters	Values
VSB Modulation	Modulation	VSB
QAM Modulation	Modulation	64QAM, 256QAM
System (According to country)	Annex ITU-T	B
Symbol Rate	Symbol Rate	* QAM64 : 5.057 * QAM256 : 5.361 * VSB : 5.381
Pilot Signal (only VSB mode)	Pilot Signal	±20MHz
Spectrum Inversion	Inv Spectrum	Normal, Inverse (Selectable)



Model 1720/1730QAM & 1720/1730QAM(A) QAM(ANNEX-A/B/C) Signal Parameters		
Description	Parameters	Values
QAM Modulation	Modulation	16, 32, 64, 128, 256
System (According to country)	Annex ITU-T	A, B, C
Symbol Rate	Symbol Rate	1000~7000K baud (0.100 ~ 20.000M baud setting available)
Spectrum Inversion	Inv Spectrum	Auto or Manual (Normal, Inverse) : Default - AUTO

Model 1720/1730 OFDM COFDM Signal Parameters	
Frequency Range	VHF III, UHF IV, V
Carrier	2k/8k
Modulation	QPSK, 16QAM, 64QAM
Guard Interval	1/4, 1/8, 1/16, 1/32
Code Rate	1/2, 2/3, 3/4, 5/6, 7/8
Spectral Inversion	Auto or Manual(Normal, Inverse) : Default - AUTO
FEC	Reed-Solomon(204, 188) and Viterbi

3-8-6. CSO OFFSET CONFIG

The parameters for CSO offsets can be adjusted in the following CSO OFFSET CONFIG. CSO offset value is selectable from → 2.5MHz to +2.5 MHz.

CSO OFFSET CONFIG	
Offset 1	-1.25
Offset 2	-0.75
Offset 3	+0.75
Offset 4	+1.25

[CSO OFFSET CONFIG]

3-8-7. C/N CONFIG

The parameters for Frequency Offset, Bandwidth, Noise Frequency related with C/N measurement can be adjusted in the following C/N COFIG.

C/N CONFIG	
Freq Offset	+4.8
Bandwidth	8.0
Noise Freq	ΔF
Level min	55
Level max	75

[C/N CONFIG]

(1) Frequency Offset(shown as Freq Offset on the display)

Value of noise frequency offset is adjustable from → 12.5MHz to +12.5MHz.

(2) Bandwidth

Noise bandwidth is adjustable from 0.1MHz to 20.00MHz.

(3) Noise Frequency(shown as Noise Freq on the display)

When noise frequency is set as ΔF, the noise level is measured depending on the selected frequency offset. When you enter 5MHz to 870MHz(or 1,000MHz → model 1703, 1730 VSB/QAM, 1730 QAM, 1730QAM(A), 1730 OFDM), it is measured depending on the entered frequency regardless of the selected frequency offset. After pressing button, press button to set noise frequency as ΔF.

(3) Level min, Level max

If the measured video carrier level is included in the limit value from the level min and level max, it is passed and in this case, Pass is displayed in Scan Mode. Otherwise, Fail is displayed in Scan Mode.



3-8-8. CHANNEL PLAN(CH PLAN)

Channel plan is divided into two kinds.: One is MATV CHANNEL PLAN and the other is CATV CHANNEL PLAN.

After selecting the desired measurement band between MATV and CATV, press button more than two seconds continuously or button once and next, press button.

MATV CHANNEL PLAN or CATV CHANNEL PLAN will appear on the screen.

CCIR		CATV CH PLAN			
CHAN	FREQUENCY	TYPE	SCAN	AUTO	
08	181.25	Ana	■	■	
09	187.25	Ana	■	■	
10	193.25	Ana	■	■	
11	199.25	Dgt	■	■	
12	205.25	Ana	■	■	
13	211.25	Dgt	■	■	

[CATV CH PLAN]

◆ Buttons

- Use or button for item changing upward.
Holding for more than 2 seconds, will speed up item changes.
- Use or button for item changing downward.
Holding for more than 2 seconds, will speed up item changes.
- Use or button for six items changing once upward.
Holding for more than 2 seconds, will speed up their changes.
- Use button to change the signal type to analog type or digital type.
- Use button to activate or deactivate channel scan.
- Use button to activate or deactivate auto report.(option)
- The adjustment for signal type or scan must be terminated by pressing button.

3-8-9. DIGITAL LIMIT SETUP

In the digital signal measurement, press button repeatedly till the DIGITAL LIMIT SETUP CONFIG appears on the LCD screen as below;

To change parameters, press the numeric entry buttons or arrow buttons to move the underline, press button.

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DIGITAL LIMIT SETUP	
Constellation	100/sym
PostBER time	30min
SNR/MER min	10
PreBER min	0.0E-4
PostBER min	0.0E-4

[DIGITAL LIMIT SETUP]

(1) Constellation

The number of data points per symbol used to product the constellation diagram, settable from 100, 200, 400, 800/sym(factory default:100/sym)

(2) Post BER time(shown as Post BER time on the display)

You can select measuring time for Post BER.
: 10sec. 30sec. 1min. 5min. 10min. 30min. 60min. Off(continuous)

(3) SNR/MER minimum (shown as SNR/MER min on the display)

You can input minimum measuring value for SNR/MER using numeric keys.
: 10sec. 30sec. 1min. 5min. 10min. 30min. 60min. Off(continuous)

(4) Pre BER minimum (shown as Pre BER min on the display)

You can input minimum measuring value for Pre BER minimum using numeric keys.

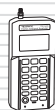
(5) Post BER minimum (shown as Post BER min on the display)

You can input minimum measuring value for Post BER minimum using numeric keys.

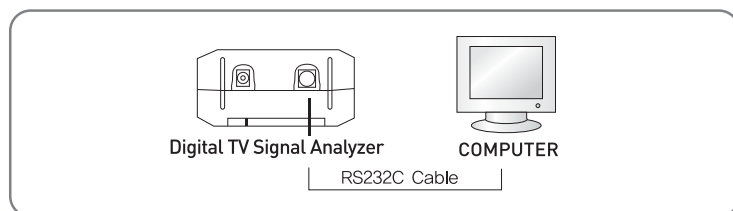
3-9. How to connect to a computer

The unit allows the user to upload or download channel plan as well as other data from Telemann software, TC-05. For more information, please see TC-05 software manual.

1. Install Telemann software, TC-05 at your computer.
2. Adjust the communication parameters of the unit to those of your computer system.(See pages 58~59, SERIAL PORT CONFIG)



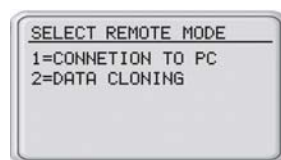
3. Connect the unit to your computer using RS232C cable.



4. Turn the power on of the unit.

5. Press , or button and then, and buttons in order. Or press button and next, button only.

The following display will appear on the screen.



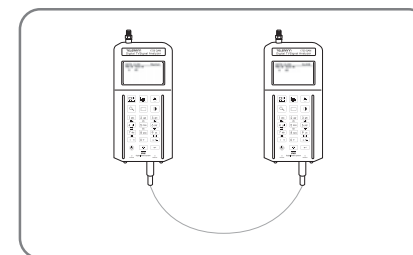
6. Once you press button, the display will change like the following display. At the same time, light of remote mode indicator will flash up.



3-10. Cloning

1. Set up the unit to transmit data as "Master" and the other one to receive the transmitted data as "Slave". In addition, set up same parameters for baud rate, data bit, parity bit and stop bit of two units.
[See pages 58~59, SERIAL PORT CONFIG]

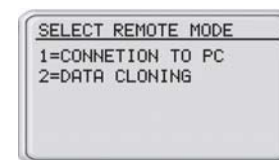
2. Connect Master unit to Slave unit using a cloning cable.



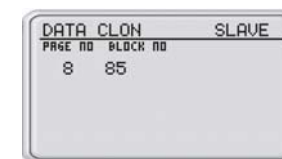
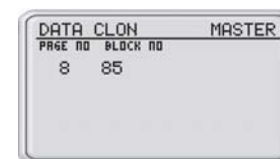
3. Turn the power of two units on.

4. Press , or button and then, and buttons in sequence. Or press button and button only.

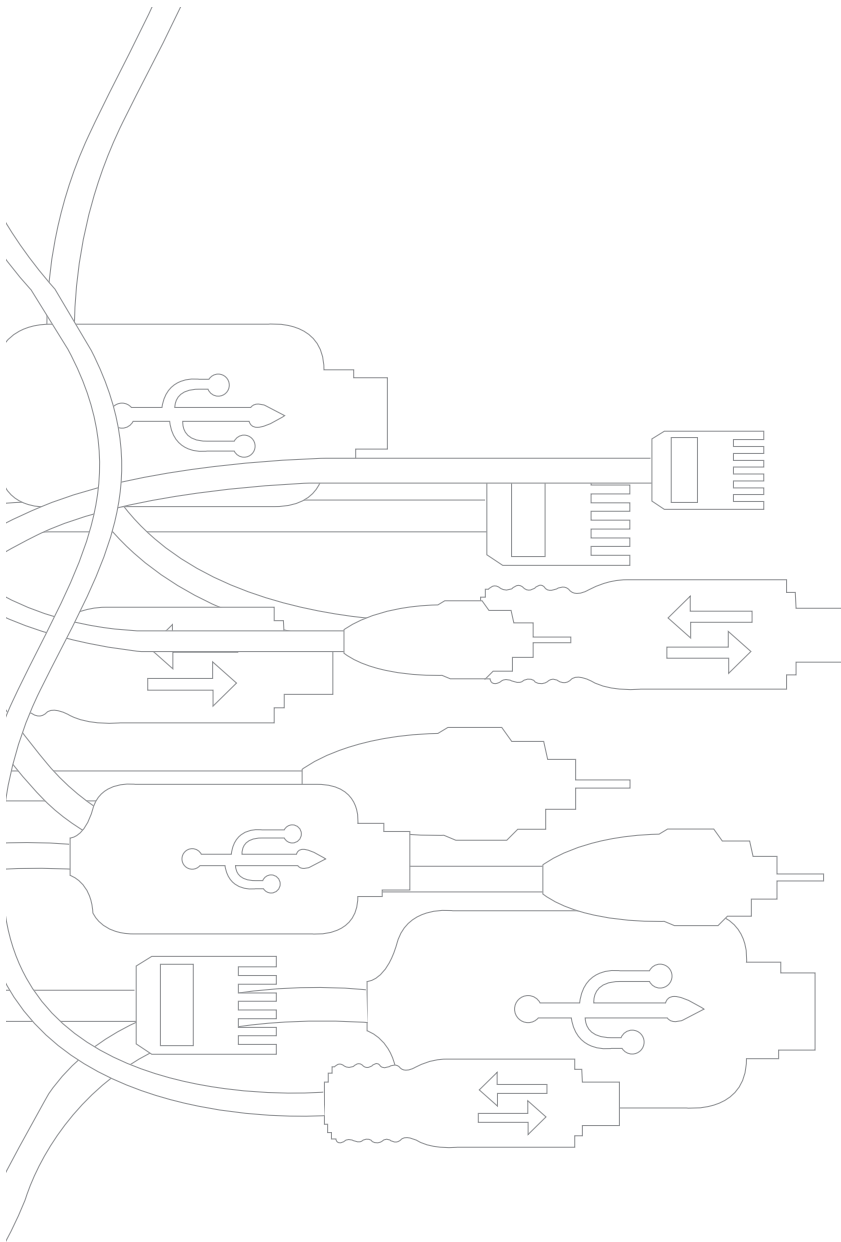
The following display will appear on the screen of two units.



5. First, press button in the Master unit and press the same button in the Slave unit. The light of remote mode indicator will flash up and two units will start cloning like the following displays. (But, the measurement files listed in the FILE DIRECTORY are not transmitted.)



6. Cloning terminates with a buzzer sound.



TELEMANN USERS MANUAL DIGITAL TV SIGNAL ANALYZER

Chapter 4. Appendix

4-1. Specifications

4-2. Warranty Information

4-3. Warranty Card



4-1. Specifications

1. Frequency

- Tuning Range
 - 1) Model 1702, 1720 VSB/QAM, 1720 QAM, 1720 QAM(A), 1720 OFDM : 5.00MHz ~ 870MHz
 - 2) Model 1703, 1730 VSB/QAM, 1730 QAM, 1730 QAM(A), 1730 OFDM : 5.00MHz ~ 1GHz
- Accuracy : ± 10 ppm
- Tuning Resolution : 10KHz
- Input Sensitivity : 15dB μ V[-45dBmV]
- Channel Plan
 - : 8 channel plans(CCIR, EIA and etc.) - Each one consists of MATV and CATV channel plans and can store 250 channels. Each MATV and CATV channel plan can store maximum 170 channels.

2. Analog Level Measurement

- Frequency Range
 - 1) Model 1702, 1720 VSB/QAM, 1720 QAM, 1720 QAM(A), 1720 OFDM : 5.00MHz ~ 870MHz
 - 2) Model 1703, 1730 VSB/QAM, 1730 QAM, 1730 QAM(A), 1730 OFDM : 5.00MHz ~ 1GHz
- Accuracy : ± 1.5 dB(0°C ~ 50°C)
- Resolution : 0.1dB
- Unit : dB μ V, dBmV, dBm
- Input Impedance : 75 Ω
- IF Bandwidth : 280KHz / 150KHz
- Level Measurement Dynamic Range
 - : 15dB μ V [-45dBmV] ~ 120dB μ V [+60dBmV]
- Video carrier level & audio carrier level measurement

- Ratio of video carrier level to audio carrier level(V/A)
 - : measurement range - 0 ~ 60dB
- Carrier to Noise Ratio Measurement(C/N)
 - 1) Ratio between carrier level and the channel's noise level
 - 2) When video carrier level is over 50dB, C/N can be measured.
- CTB/CSO Measurement
 - CTB : Ratio of the peak level of the video carrier to that of the distortion products of third order beat
 - CSO : Ratio of the peak level of the video carrier to that of the distortion products of second order beat.(CSO offset values : -2.5MHz ~ +2.5MHz)

3. Digital Signal Level Measurement

(1) Telemann Digital Signal Analyzers

- Digital channel power measurement
 - : Power measurement in the channel bandwidth by integration method (QAM, VSB, COFDM, QPSK signals)
- Carrier to Noise Ratio Measurement(C/N)
 - 1) Ratio between the digital channel power and the noise level
 - 2) When video carrier level is over 40dB, C/N can be measured.

(2) Model 1720/1730 VSB(ATSC) & QAM(ANNEX-B)

- Frequency Range : 54~863MHz
- Measurement Units : dB μ V, dBmV, dBm
- Frequency Resolution : 62.5KHz
- Power Measurement Resolution : 0.1dB
- Power Measurement Accuracy : ± 1.5 dB(0 ~ 50°C)
- Lock Range : 45dB μ V[-15dBmV] ~ 120dB μ V[+60dBmV]
- SNR/MER Measurement
 - VSB Range : 15 ~ 37dB(± 2.0 dB)
 - 64QAM Range : 22 ~ 37dB(± 2.0 dB)



- 256QAM Range : 28 ~ 37dB(± 2.0 dB)
- Min. Measurement Value Setting : 10 ~ 40dB
- Symbol Rate
 - : VSB - 5.381, 64QAM-5.057, 256QAM-5.361
- Pre-BER, Post-BER Measurement
 - Range : 10E-2 ~ 10E-8
 - Post-BER Measurement Time Setting & Real Error Counter
 - : Real Errors for Post-BER are countered according to the measurement setting time. ; 10sec./30sec./1min./5min./10min./30min./60min/Off(Continuous)
 - Min. Measurement Value Setting for Pre-BER, Post-BER
 - : 0.0E-4 ~ 9.9E-8
- EVM Measurement Range : 1.5 ~ 8%
- Pilot Signal Value Setting(VSB mode) : ± 20 MHz
- Constellation Diagram Analysis
 - : VSB, 64QAM, 256QAM - 1/4 Zoom
- Spectrum Inversion : Normal/Inverse(selectable)
- Scan/Data Logger/Saving/Printing
 - : Video Level-SNR(MER), Video Level-BER

[3] Model 1720/1730 QAM & QAM(A) (ANNEX-A,B,C)

- Frequency Range : 47~862MHz
- Measurement Units : dB μ V, dBmV, dBm
- Frequency Resolution : 62.5KHz
- Power Measurement Resolution : 0.1dB
- Power Measurement Accuracy : ± 1.5 dB(0 ~ 50°C)
- Lock Range : 50dB μ V(-10dBmV) ~ 120dB μ V(+60dBmV)
- SNR/MER Measurement
 - Range : 22~34dB for 64QAM(± 12.0 dB)
 - Min. Measurement Value Setting : 10 ~ 40dB
- Roll-off(α) factor of Nyquist Filter : 0.13 or 0.15
- Symbol Rate : 1000 ~ 7000K baud (0.10 ~ 20M baud setting adjustable)

- Pre-BER, Post-BER Measurement
 - Range : 10E-2 ~ 10E-9
 - Post-BER Measurement Time Setting & Real Error Counter
 - : Real Errors for Post-BER are countered according to the measurement setting time.; 10sec./30sec./1min./5min./10min./30min./60min/Off(Continuous)
 - Min. Measurement Value Setting for Pre-BER, Post-BER
 - : 0.0E-4 ~ 9.9E-8
- EVM Measurement Range : 1.5 ~ 8.0%
- Constellation Diagram Analysis
 - : 16QAM, 32QAM, 64QAM, 128QAM, 256QAM - 1/4 Zoom
- Spectrum Inversion : Auto(default) or Manual(Normal or Inverse)
 - ▶ Model 1720/1730QAM(A) measure digital channel power, MER and Pre-BER only and not measure Post-BER, EVM, Constellation.

[4] Model 1720/1730 OFDM

- Frequency Range : VHF III , UHF IV V
- Measurement Units : dB μ V, dBmV, dBm
- Frequency Resolution : 166KHz
- Power Measurement Resolution : 0.1dB
- Power Measurement Accuracy : ± 1.5 dB(0 ~ 50°C)
- Measurement Dynamic Range
 - : 15dB μ V (-45dBmV) ~ 120dB μ V(+60dBmV)
- Carrier : 2k/8k
- Modulation : QPSK, 16QAM, 64QAM
- Guard Interval : 1/4, 1/8, 1/16, 1/32
- Code Rate : 1/2, 2/3, 3/4, 5/6, 7/8
- Spectrum Inversion : Normal/Inverse(selectable)
- FEC : Reed-Solomon(204, 188) and Viterbi
- SNR/MER Measurement
 - Range : up to 37dB(± 2 dB)
 - Min. Measurement Value Setting : 10 ~ 40dB
- Pre-BER, Post-BER Measurement



- Range : 10E-2 ~ 10E-8

- Post-BER Measurement Time Setting & Real Error Counter
: Real Errors for Post-BER is countered according to the measurement setting time. ; 10sec./30sec./1min./5min./10min./30min./60min/Off(Continuous)

- Min. Measurement Value Setting for Pre-BER, Post-BER
: 0.0E-4 ~ 9.9E-8

○ EVM Measurement Range : 1.5 ~ 8%

○ Constellation diagram Analysis : QPSK, 16QAM, 64QAM - 1/4 Zoom

4. Channel Spectrum Analyzer (ANALOG/DIGITAL CHANNELS)

○ Measurement Range : 15dB μ V (45dBmV) ~ 120dB μ V(+60dBmV)
: Reference level division - 5/10dB unit setting available

○ Span : Max. 110channels can be displayed at one screen.

○ Indication
: Analog Channel(Video carrier level/Audio carrier level)
Digital Channel(Level Power)

5. Frequency Spectrum Analysis (Analog/Digital Channels)

○ Measurement Range : 15dB μ V (45dBmV) ~ 120dB μ V(+60dBmV)
: Reference level division - 5/10dB unit setting available

○ Detection Method : PEAK, AVERAGE

○ Bandwidth : 280KHz/150KHz

○ Indication
: Analog Channel(Video carrier level/Audio carrier level)
Digital Channel(Level Power)

○ Reverse noise spectrum : 5 ~ 107.25MHz

○ Span and Resolution

Detector	Span	Display Resolution
PEAK AVERAGE	FULL	8MHz
	220MHz	2MHz
	110MHz	1MHz
	56MHz	500KHz
	22MHz	200KHz
	11MHz	100KHz
	6MHz	50KHz
	2MHz	20KHz

6. TILT SPECTRUM ANALYSIS (ANALOG/DIGITAL CHANNELS)

○ Frequency Range

1) Model 1702, 1720 VSB/QAM, 1720 QAM, 1720 QAM(A), 1720 OFDM
: 5.00MHz ~ 870MHz

2) Model 1703, 1730 VSB/QAM, 1730 QAM, 1730 QAM(A), 1730 OFDM
: 5.00MHz ~ 1GHz

○ Indication(Bar Graph) : Tilt Slope, Video Level

○ Max. Measurement Numbers : Max. 15

○ Auto Arrangement depending on frequencies

7. Line AC/DC Voltage Measurement

○ Range : $\pm 10 \sim 110V$

○ Resolution : $\pm 1\%(\pm 1 \text{ digit})$

○ Indication : AC/DC maximum 4 figures

8. Battery Voltage Measurement

○ Range : 8V ~ 15V



10. Scan Mode

- Active Level Scan : MATV band, CATV band, Tilt channel, Memory band
- Scan item selection
 - 1) VIDEO AUDIO : Video carrier level - Audio carrier level or V/A ratio
 - 2) VIDEO PASS : Video carrier level - Pass(for Fail)
 - 3) VIDEO C/N MER :
Video carrier level - C/N ratio(for analog channel) or MER(for digital channel)
 - 4) VIDEO C/N BER :
Video carrier level - C/N ratio(for analog channel) or BER(for digital channel)

11. File

- Number of Storable File : 32(changeable according to data volume)
- Number of Storable Channel or Frequency per file : maximum 170
- Data Logger
 - 1) Model 1702/1703
: Scan measurement data, Spectrum analysis data
 - 2) Model 1720/1730 VSB/QAM, 1720/1730 QAM, 1720/1730 QAM(A), 1720/1730 OFDM
: Scan measurement data, Spectrum analysis data, SNR(MER), BER, Constellation diagram, Parameter display

12. Power Supply

- Battery : 9.6V 2100mAh(AA size, Ni-MH 1.2V X 8)
- Battery Indication : Graphic indication on the display -
- Duration
: Approx. 5 hours in Analog Signal Measurement, 3hours in Digital Signal Measurement
- Auto Time-out
: Power turns off the unit automatically when it has remained inactive for a period of time to conserve battery life. The time out period is programmable to ; 5min, 10min, 30min, Off(continuous).
- Main Adapter
: 220V:15V 500mA 60Hz(Adapter can be offered according to each country' s conditions)

13. Circumstances

- Useable Temperature : 0°C ~ 60°C
- Humidity : @80%

14. Mechanical Features

- Dimension : 218mm W X 105mm H X 58mm D
- Weight
 - 850g(including batteries)
: Model 1702/1703
 - 920g(including batteries)
: Model 1720/1730 VSB/QAM, 1720/1730 QAM, 1720/1730 QAM(A), 1720/1730 OFDM
- Graphic LCD display with Backlight : 128 X 64 dot matrix
- Casing Structure : shock-proof plastic(ABS)

15. Standard Accessories

- Carrying bag
- Shoulder strap
- F-JJ connector
- Users manual

16. Optional Accessories

- RC232C interface cable : It transmits data to computer or printer.
- Cloning Cable
- Car cigarette lighter adapter cable
- Coaxial Cable



TELEMANN

4-2. Warranty Information

Telemann Corporation(hereafter called "Telemann") warrants all products against defects in material and workmanship under normal use and provides for one year from the date of purchase by the first buyer. Please note that this does not include consumable items such as batteries.

The liability of Telemann(or its appointed maintenance agent) is limited to the cost of repair and/or replacement of the product under warranty.

In order to keep this warranty effective, the product must be handled and used as prescribed in the operating manuals accompanying this warranty.

The warranty does not cover any damage caused by improper storage, improper installation, unauthorized modification, accident, misuse, abuse, inadequate maintenance or negligence. It is also invalidated if unauthorized person carry out any alterations or repair.

In the event that you should require service assistance, please contact the dealer from where the product was initially purchased.

If this is not possible, for example, if you moved home, please contact the Telemann Service Team on 82 32 678 8566/7. Please have your full Telemann model number and serial number, date and place, purchase and a brief description of the fault/query ready when contacting our service team.

If the product is outside the warranty period, you should contact the dealer or Telemann service team for a chargeable repair.

If the product is covered by an extended warranty, you should contact the dealer from whom this extended warranty was purchased(usually the same dealer from which the product was originally purchased).

4-3. Warranty Card

Thanks for taking the time to fill out your warranty card. Please fill in the requested information below and your new product will be properly registered.

Warranty Card

Product : Digital TV Signal Analyzer

Model No. :

Serial No. :

Date of Purchase (MM/DD/YY) : / /

Buyer Name :

Address :

Phone Number :

Dealer Name :

Address :

Phone Number :

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